LIBRARY OF CONGRESS
COPYRIGHT
FEB 27 1888
530
CITY OF WASHINGTON

PRICE 15 CENTS

FEBRUARY 25, 1888.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXIII. | REGULAR EDITION | NO. 635.

ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

TICKNOR & COMPANY

BOSTON MASS.

CONTENTS.

Editorial Summary.
Ancient and Modern Light-houses. —XVIII.
Notes of Travel. Chicago.—III.
Some General Observations on the Strength and Stability of Masonry.
Electricity and Sewage.
Books and Papers.
Societies.
Communications.
Notes and Clippings.
Trade Surveys.

ILLUSTRATIONS.

Westminster Palace.
[Gelatine Print issued only with Gelatine and Imperial editions.]
Fowey Rock Light-house.
The United States Court-house and Post-office, Williamsport, Pa.
Y. M C. A. Building, San Diego, Cal.
Stores, St Paul, Minn.
Christ Church, Herkimer, N. Y.

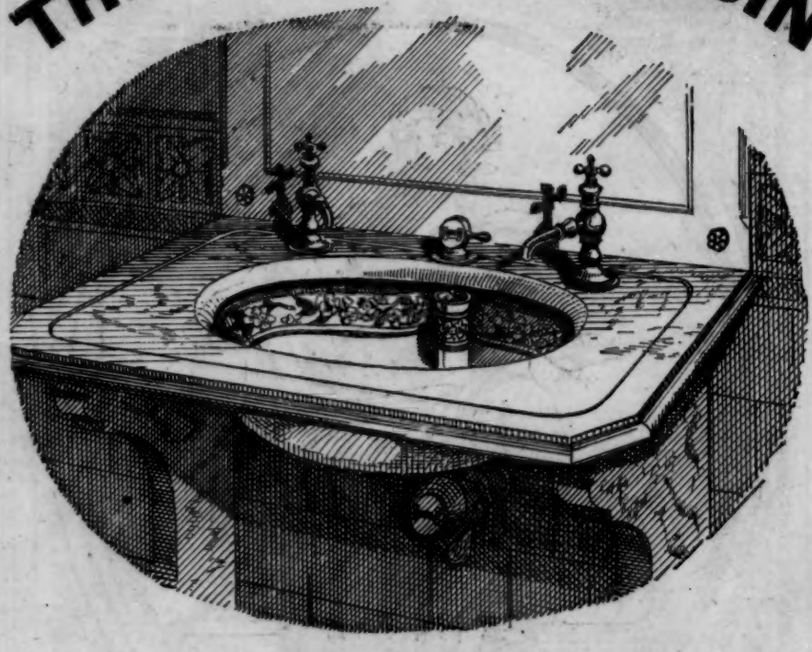
SANITAS BASIN LIFT.

+ PLUMBING +
SANITAS
+ APPLIANCES +

PLAN OF BASIN.

THE SANITAS BASIN

QUICK EMPTYING, ORNAMENTAL.



STAND-PIPE OVERFLOW.

WITH SANITAS TRAP ATTACHED.

CAUTION!

THE GREAT AND UNIVERSALLY ACKNOWLEDGED MERITS of the Sanitas Appliances have given rise to a number of inferior imitations and infringements, against the use of which the public are hereby cautioned. The "Sanitas" is the original open Stand-pipe Basin, having a removable stand-pipe, operated by a mechanism fixed in a frame above, and the "Sanitas" Trap, the only one having the horizontal water-way arranged to render the trap self-scouring and anti-siphonic, and having the reflecting partition within the body. All those who manufacture or use these features, or others in our Patent claims, in any form, are infringers and will be prosecuted for damages.

THE "SANITAS" MANUFACTURING CO., 207 TREMONT ST., BOSTON, MASS.

BRANCH OFFICES: 92 Beekman St., New York, N. Y.; 47 to 49 Dearborn St., Chicago, Ill.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXIII. Copyright, 1888, by TICKNOR & COMPANY, Boston, Mass. No. 635.

FEBRUARY 25, 1888.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS.

SUMMARY: —
The Way in which the Price of Iron and Steel has been kept up. — Probable effect of removing the Tax on Imported Metals. — A Southern Competition. — Deaths of M. Questel and Mr. Edward I' Anson, Architects. — The Expansion of Terra-Cotta. — Wood-working Establishments in Berlin. — Discoveries at Sidon. — Theatre-Fires in 1886. 85
ANCIENT AND MODERN LIGHT-HOUSES. — XVIII. 87
NOTES OF TRAVEL. — CHICAGO. III. 88
ILLUSTRATIONS: —
Westminster Palace. — Fowey Rock Light-house. — The United States Court-house and Post-office, Williamsport, Pa. — Y. M. C. A. Building, San Diego, Cal. — Store for Messrs. De Coster & Clark, St. Paul, Minn. — Store for Mr. M. E. Mayall, St. Paul, Minn. — Christ Church, Herkimer, N. Y. . 91
SOME GENERAL OBSERVATIONS ON THE STRENGTH AND STABILITY OF MASONRY. — I. 91
ELECTRICITY AND SEWAGE. 93
BOOKS AND PAPERS. 93
SOCIETIES. 95
COMMUNICATIONS: —
Who should pay the Expert? — The Commission on a Party-wall. — The Architectural League's Competition. — Address. 95
NOTES AND CLIPPINGS. 96
TRADE SURVEYS. 96

ONE of the New York papers has recently called attention to the unnecessarily high price of structural iron in this country, describing the well-known combination of manufacturers by which the price is kept up. We will not undertake to criticise the morality of the combination, or to enter upon the general question of the policy of keeping up prices by artificial means, but there is something interesting in the consideration of the effect of the present system upon the art of construction in the United States. The wholesale price of rolled-iron floor-beams is now in this country three and three-tenths cents per pound at the mills, the rate being the same at all the seven mills which furnish such beams. In France and Belgium there has recently been a great advance in the price of this, as of other sorts of structural iron, but the latest quotations give one and nineteen one-hundredths cents per pound for rolled floor-beams as the price at the French mills, while the Belgian manufactories sell even lower, the market quotation for floor-beams in Belgium having been, not long ago, less than nine-tenths of a cent a pound, or little more than one-fourth of the American price. The present English price is one and sixteen one-hundredths cents per pound. Of course, at these rates the foreign beams would be imported if it were not for certain obstacles, of which one of the most serious is a specific duty of one and one-fourth cents per pound, or about one hundred and forty per cent on the Belgian price. The cost of handling, and transporting four thousand miles across the sea, adds nearly as much more, but even with these burdens, the foreign beams are delivered in New York for considerably less than the price of the American ones, and would be extensively used, were it not for the fact that most architects depend, in estimating the strength of floors, upon the tables given in the books which are issued by the American rolling-mills, and write their specifications in accordance with what they find in those books, so that the foreign beams, which differ in section from ours, are likely to be rejected, as not in accordance with the specification, and be thrown back upon the contractor's hands. We had once a case which illustrates this point. The specification required that a certain sidewalk should be laid with twelve-and-one-quarter-inch rolled beams of a certain weight per yard, the weight being that of a familiar American pattern. The contractor, instead of sending to the American mill for beams of exactly the size and weight specified, ordered his beams from Belgium. They arrived, all cut to the proper lengths, but proved to be only twelve inches high, and somewhat lighter than the specification required, so that, as the specification did not provide for any surplus strength, there was nothing to be done but to refuse to accept them, and to order American beams in the place of them at the contractor's expense. In some respects the foreign beams are better than ours, the flanges being usually wider, so as to give a lateral stiffness which is valuable, while various patterns of floor-beams are furnished five or six inches high and very light, so that a man can handle them much more easily than he could a wooden beam of the same length, but the unwillingness of architects to cut off competition by specifying any particular manufacture, together with the difficulty of getting accurate profiles and calculating the moments of inertia of the foreign sections, practically prevents their use by architects, unless for very extensive buildings, where contracts are made on so large a scale that special measures can be taken to secure the greatest economy.

WHAT would be the result of removing the burdens from the importation of structural iron, or the reduction of the price of American beams to the English and Continental standard, may be readily predicted. At present, a floor laid with iron beams is too costly a luxury in this country for any but the very rich; but if such beams could be procured at one cent a pound, they would be very nearly as cheap as wooden joists. In practice, the floor-beams used in Paris are rather lighter, with a given stiffness, than our patterns, but taking as a standard of comparison a Pencoyd four-inch I-beam, weighing eighteen and one-half pounds to the yard, we find that such a beam twenty feet long will carry three thousand two hundred and twenty pounds distributed load, or one hundred and sixty-one pounds to the foot, and will weigh one hundred and twenty-three pounds, and cost, at something more than the Belgian price, a dollar and twenty-three cents. In comparison with this, a three by twelve hard-pine joist of the same length will carry thirty-nine hundred and sixty pounds distributed load, by the most recent data, but it will weigh two hundred and twenty pounds more than the iron beam, leaving the net bearing capacity for comparison thirty-seven hundred and forty pounds. This is seventeen per cent more than the iron beam, but at thirty dollars per thousand feet the wooden joist will cost a dollar and eighty cents, or fifty per cent more than the iron, while, as it will occupy three times the height, and require a correspondingly greater amount of material, in the shape of masonry or iron columns, to secure the same height in the rooms, the cost of using it would be practically more than double that of the iron beam. In districts where spruce is the ordinary framing timber, cheap as this is, there would still be a considerable economy in using iron, while the advantages in point of resistance to fire and decay would be enormous. On the other side of the water the clumsy methods used to attach floors and ceilings to iron beams carry the cost of such a construction beyond that which employs wooden joists; but the art of handling structural iron is much more highly developed here than it is abroad, and if our architects could get metal floor-beams at the foreign rate, they might be depended upon to improve the details of the construction in which they are used so rapidly that in a few years a city building with floors of wooden joists would be a rare exception.

A SOUTHERN correspondent sends us a circular inviting designs in competition for a church in Tennessee. The cost of the structure is not to exceed sixty thousand dollars. Intending competitors are requested to furnish "plans, specifications and estimates," and "the architect whose plans and specifications are accepted will be paid one hundred dollars." Moreover, "gilt-edged bond will be required of the successful competitor for faithful and satisfactory work, and quality of material in all their branches." Just what this last sentence means is not clear, but we suppose that it is to be explained by remembering the confusion which exists in the South between builders and architects. The average Southerner, when he wants a house, goes to the man who deals in houses, namely, the nearest builder, and makes such a bargain as seems to him proper. Perhaps the man of planks has an apprentice who has been to an evening drawing-school, or a talented son just entering upon the study of long division at the Academy, and, to hasten the conclusion of the trade, or, perhaps, to head-off a rival builder, who does not enjoy these advantages, he has the proposed structure "drawed out" for his customer's edification. That there could be any better course than this for securing a suitable design for a church edifice does not seem to have occurred to the good people of this particular Tennessee community. They have a glimmering of an idea that there is such a thing as a beautiful building, in distinction

from an ugly one, and mention that "architectural beauty and finish are sought," although "not at the sacrifice of substantial solidity," and, apparently feeling that it may be an extra expense to the builder to get anything like "architectural beauty and finish" inserted into his drawings, they considerately promise a *douceur* to cover this outlay. We presume that the idea of paying an architect fifteen hundred dollars to "draw out" their church would seem to them preposterous, and we are not sure that they may not be right, considering the sort of appreciation that might be anticipated for a good design.

TWO more distinguished architects have died within a few weeks, M. Questel in France, and Mr. Edward I' Anson, the President of the Royal Institute of British Architects, in England. Mr. I' Anson studied his profession under his father, who was an architect of distinction in the City of London, and the son succeeded to an important practice in the designing of commercial buildings, and in the adjustment of cases relating to City property, with the value of which he was thoroughly familiar. His skill as a surveyor and referee was so remarkable as to win for him the office of President of the Surveyors' Institution in the same year that, in recognition of his attainments in another department of the profession, he was elected President of the Royal Institute of British Architects. Although constantly occupied with work demanding judgment and experience rather than more æsthetic qualities he was a good deal of an artist. He spent much time in travelling and sketching, and his executed works, among the more important of which are the Corn Exchange in Mark Lane, and the Bible Society's house on Queen Victoria street, are worthy of the highest praise. Among other things, he is said to have the credit of being the first man in London to design buildings intended wholly for business offices. It was formerly the rule for merchants to have counting-rooms in their warehouses, and for other business men to hire rooms in private houses; but, on his suggestion, two or three buildings were erected, entirely occupied by small rooms for offices, and these proved so popular that the fashion soon spread. In the death of M. Questel, the profession loses one of its wisest and most honored members. Born in 1807, he had been for two generations a conspicuous figure in French art, not only through his own work, but by his singular success in directing the career of a long list of distinguished pupils. He received his own training under Peyre, Blouet and Duban, and after a three years' residence in Italy was appointed to a modest position on one of the Government buildings in Paris. He rose rapidly, and was Inspecteur des Travaux when he won in competition the important commission for the Church of St. Paul at Nîmes. This was followed by the design for the fountain in the Esplanade at Nîmes, with several other important works, and he was about the same time appointed to the Commission for the Preservation of Historical Monuments, preparing in the course of his duties many restorations and measured drawings of the principal Roman buildings on French soil. His connection with the School of Fine Arts was soon resumed, by his succession to the place formerly occupied by his own master, Blouet; and the merit of his pupils, among whom were Daumet, Brune, Pascal, Joyaux, Noguet, Raulin and many other winners of the Prize of Rome, gained him a high reputation as a teacher as well as an artist. Various other important works brought him added honors. In 1871, he was elected a member of the Institute of France, in the Section of Fine Arts, succeeding his master Duban; and in 1884 he was chosen President of the Société Centrale des Architectes Français, the principal French professional body, and, soon after, of the Caisse de Defense Mutuelle des Architectes, then just formed.

THE *Builder* mentions an article by Mr. T. Mellard Reade in the *Geological Magazine*, upon the permanent expansion of terra-cotta by the weather. In the case which he describes, a terra-cotta coping on a garden wall lengthened so much after setting in place as to raise itself in the form of an arch, the middle portion of which was lifted an inch from its bed. Naturally, the coping pieces at the middle and springing points of the arch were broken, and on replacing the broken pieces it was found that since the first setting the coping had expanded about a quarter of an inch in a length of thirty feet. One might suppose that such expansion would be more likely to be due to the swelling of the cement in the joints than to any change in size of the terra-cotta, but careful tests, and comparison of similar cases, convinced Mr. Reade that the cement was not here at fault. The English terra-cotta is softer than ours, and it seems not impossible that it might absorb water enough, when exposed to the weather, to cause some enlargement. We have never heard of any similar occurrence in this country, but if terra-cotta is to be used, as in the new Pension Office at Washington, in bands three or four hundred feet long, it would be a wise precaution to have some careful experiments made.

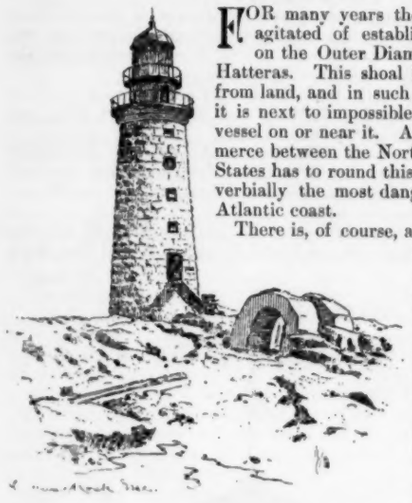
THE *Scientific American* copies from the Vienna insurance journal, *Assecuranz*, an account of the new police regulations in regard to wood-working shops in Berlin, which would rather startle the proprietor of a New York or Chicago planing-mill. By these regulations every wood-working establishment must have its principal walls of brick or stone. If there are rooms over the shop for habitation, the shop ceilings must be plastered, and the plaster covered with corrugated sheet-iron; and the floors of the rooms above must be packed with fireproof filling. The shop doors must be of iron, hung on pintles or in iron frames, and the stairs leading to them must be fireproof. Shavings must be placed in a brick bin, vaulted overhead, and shut off by an iron door. Under no circumstances is a shop to be heated by iron stoves, or to have a metallic smoke-pipe carried through it. Stoves, if used, must be of stone or tiles, so arranged that they can be supplied with fuel only from outside of the work-room; and flues must be built in the walls. Glue must not be warmed in the shop, but every shop must have a glue-heating room, having thick brick walls, a brick vaulted ceiling, and floor of masonry, separated from the shop by an iron door.

AN archæological treasure has recently been discovered at Saïdi, the ancient Sidon, on the coast of Asia Minor, and secured by the Turkish Government. It seems that some workmen, while digging a well in a garden in the town, broke into a chamber, with walls of masonry, in which were some ancient sarcophagi. A telegram was immediately sent to the Director of the Imperial Museum at Constantinople, who arrived at the spot in time to prevent any displacement of the precious objects. On removing the *debris* in which they were buried, seventeen of the sarcophagi were found, of various ages and styles, six being considered to be Greek, six Phœnician, one Egyptian, one Libyan, and three of indeterminate character. Some of them were exquisitely sculptured, one, in particular, having its exposed face divided into eighteen panels, in each of which was a beautiful bas-relief of a weeping girl. On opening the sarcophagi, nothing was found of value except two gold buttons and an ornament for the head, nor any inscription or other indication of the quality of the persons interred in them, so that the Director concluded that they must have been opened and robbed ages ago, probably, in his opinion, by the Crusaders. *La Semaine des Constructeurs*, however, defends the reputation of the Crusaders by remarking that the tombs are much more likely to have been desecrated by the Persians, who captured and destroyed Sidon in B. C. 351, just after the period to which the best of the sarcophagi seem to belong.

LA SEMAINE DES CONSTRUCTEURS publishes first this year the list of theatres burned during 1887. Including circus and concert halls, the list comprehends nineteen structures used for public amusement which were wholly or partially destroyed during the year, with a loss of about four hundred lives. The first fire mentioned is that which consumed the theatre of Göttingen in Prussia on the tenth of January. Six days later the circus of Sidoli at Bucharest was burned, and on the thirteenth of February the Northampton Opera-house in England. Four days after this a theatre was destroyed at Laybach in Austria, and on March 28th the Cirque Herzog at Ghent. The terrible fire at the Paris Opéra Comique occurred May 26th, and in June a theatre and a circus were burned in Russia, a concert-hall at Rotterdam, and the Théâtre Lafayette at Rouen. In July one theatre was burned in the United States, one in Spain and one in Holland. In August the opera-house at Stockport in England, and on the sixth of September the Exeter Theatre. On the fourteenth of September a concert-hall at Calais was destroyed, in November a circus at Hamburg, and in December the Islington Theatre in London. To these eighteen conflagrations *La Semaine* adds the panic at the Dilettanti Theatre in London, caused by a harmless blaze, in which many persons lost their lives, as a disaster which should be classed with the fires.

ANCIENT AND MODERN LIGHT-HOUSES.[1]—XVIII.

CAPE HATTERAS.



FOR many years the subject has been agitated of establishing a light-house on the Outer Diamond Shoal, off Cape Hatteras. This shoal is about eight miles from land, and in such stormy waters that it is next to impossible to maintain a light-vessel on or near it. All the sea-going commerce between the Northern and Southern States has to round this point, and it is proverbially the most dangerous place on the Atlantic coast.

There is, of course, a light on Cape Hatteras, but the shoal is so distant that it is very difficult to estimate its locality. south-bound vessels to avoid the current of the gulf-stream have to pass close to it, and it has the gloomy reputation of causing more wrecks and disasters than any other place in America.

The success with the Rothersand and Fourteen-foot Bank Light-houses in my opinion point the way to obtaining a secure foundation in these shifting sands, and I believe that the solution of the problem consists in building a steel or cast-iron cylinder forty-five feet in diameter, sinking it on the shoal so that its base will be below any possibility of wave-action, filling it with concrete, and protecting it on the exterior by the liberal use of rip-rap in large blocks.

The cylinder should be double, the inner cylinder being fifteen feet in diameter and very strongly braced to the exterior one, the connection between the interior and exterior cylinder at the bottom should be conical in shape, and would answer for the working-chamber if the cylinder were to be sunk by the pneumatic process, though I believe it possible to sink it rapidly by dredging from the interior. The cylinder could be so built as to admit of either plan being used.

At a suitable locality on the Outer Diamond, there is a depth of about twenty feet; the cylinder should be put together at some safe harbor, floated to this point and sunk as quickly as possible. I estimate that when the bottom of the cylinder reaches fifty feet below the surface of the shoal and the rip-rap is placed around it, it will be safe from the scour of the waves.

One of the many difficulties attending this work is that the nearest available harbor is Cape Hatteras Inlet, only fifteen feet deep and fifteen miles away. Should a storm overtake the cylinder while being towed to the site, it would, in all probability, be lost, and the same catastrophe might occur if there were a heavy blow during the first part of the sinking of the cylinder; after it had gone down ten or fifteen feet the danger would be much less, and if the attending vessels were driven away by stress of weather, they might have a reasonable assurance of finding the cylinder in place on their return. The power of the cylinder to resist the waves, before it was filled with concrete, would depend entirely on the strength of the interior bracing, and too much pains could not be expended in making this of the best design, material and workmanship.

With the foundation once secured, it would be of no great difficulty to erect a suitable superstructure.

Should this light-house be successfully established, it will be a remarkable feat of light-house engineering, and be of benefit to more commerce than any one light-house in the world.

Barring accidents, the cost should not exceed $300,000 for the foundation, but it would not be safe to commence work without having at least $500,000 available. The accompanying sketches give a general idea of the plan and elevation of the kind of cylinder proposed.

Congress will be asked this session to appropriate the necessary funds for this important work. Should the appropriation be made, the foundation could be built and placed, barring accidents, in less than two years.

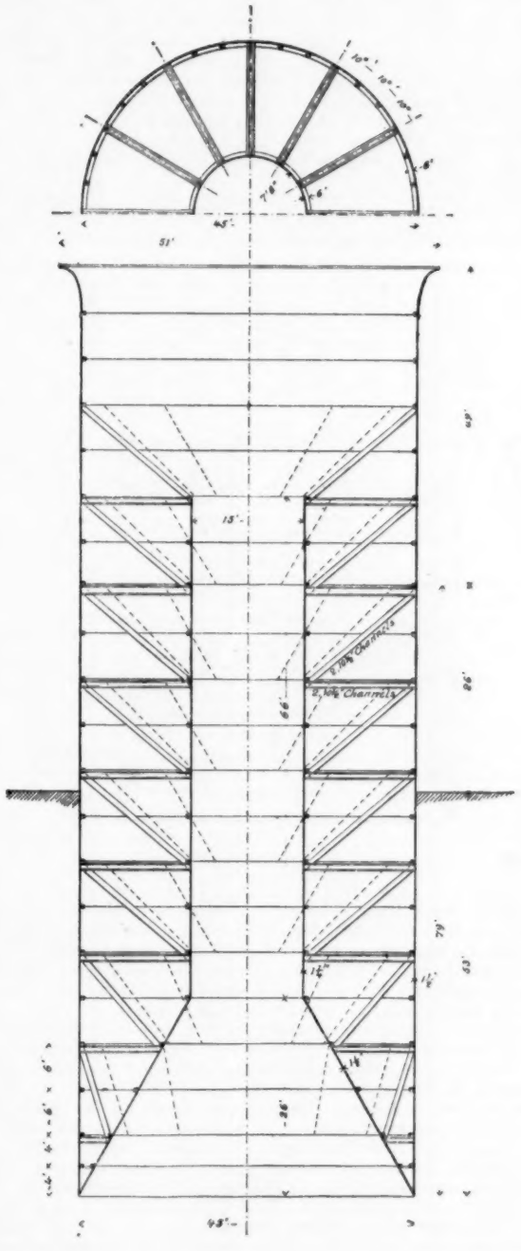
SKELETON IRON LIGHT-HOUSES.

Another type is the skeleton iron light-house: this is especially adapted to sites where it is desired to erect a lofty structure without too much weight; it may rest on iron-piles, screw-piles, grillage or other foundation, depending on whether the light-house stands in the water or on land, and whether the site is rock, stiff clay, sand, earth or mud.

The finest two light-houses of this kind, which rest on iron-piles driven in coral rock, are those erected on Fowey Rocks and American Shoals, Florida. They are duplicates of each other, the first one built being the one at Fowey Rocks on the east coast of Florida, at the northern extremity of Florida Reefs.

Examinations to test the character of this reef were made in 1875; the engineer reported: "It was with the greatest difficulty and delay that a sailing vessel could reach the spot in weather sufficiently calm to do any work. The rock composing the reef is harder than that farther south and west, and it is believed will furnish a secure foundation for the kind of structure decided upon." During the same year the designs for the light-house were well advanced, and preliminary works connected with the erection of the light-house were begun. These consisted in building at Soldier Key, four-and-one-half miles distant from the reef, a substantial wharf with track, store-house and quarters: all these buildings had to be raised six feet above the surface and strongly secured, as during hurricanes the sea sweeps entirely over the surface of the Key. At the site the working platform was completed, and contract was made for the delivery of the ironwork for the foundation and first stories of the light-house, which was delivered at Soldier Key in the spring of 1867, and during the same year all the foundation-piles were driven as follows:

The disc for the central foundation-pile was first lowered to its place, and through this disc the first iron-pile was driven. One of the perimeter discs was then placed in position and located by a



gauge consisting of a heavy iron I-beam, lying on the bottom between and in immediate contact with the edges of both discs, and then the first perimeter-pile was driven through the centre of this disc. The greatest precaution had to be taken to drive these piles vertically; hence, after each blow of the hammer the pile was tested with a plummet, and the slightest deviation from the vertical was rectified

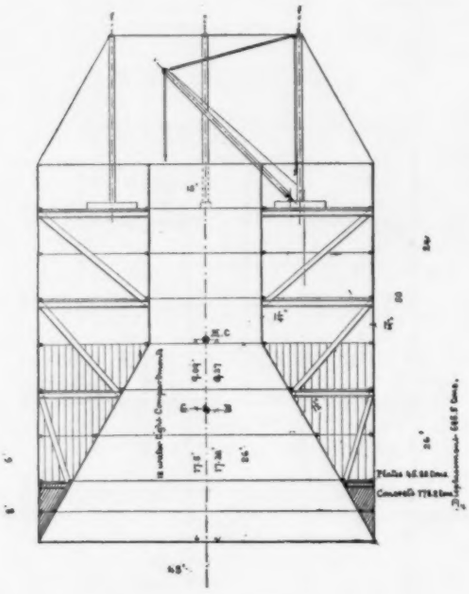
[1] Continued from page 312, No. 627.

by tackles, used as guides, fastened to the top of the pile. Each iron-pile was driven about ten feet into the rock. In locating the disc for the next perimeter-pile, two gauges were necessary, one to obtain the proper distance from the central pile, the other to maintain the proper distance from the perimeter-pile just driven; and these two gauges were alike except in length. The discs were dragged along the bottom until their outer edges just touched the free edges of the gauges. Each pile was then driven through the centre of its disc. After all of them were driven, their tops were levelled by cutting off each to the line of the lowest. The piles were then capped with their respective sockets; the horizontal girders were inserted, the diagonal tension-rods were placed and screwed up, and the foundation series was completed. This work, including the building of the temporary platform occupied just two months, during which time the sea was quite smooth.

Owing to various delays in the manufacture of the superstructure it did not arrive at Soldier Key until November 12, 1877. The weather preceding its arrival and for three months after was unfavorable for its erection. Gale followed gale, and though a large force of workmen was at Soldier Key ready to work when weather permitted, nothing could be done. For six weeks there was but one day on which a landing could be effected at the light-house site. This day was utilized by laying a decking of four-inch plank on the wooden platform. Finding the weather still unfavorable, with no immediate prospect of getting to the site, and all the shore-work completed, it was decided on December 13, 1877, to temporarily suspend operation.

On February 24, 1878, the weather appearing more favorable for reef-operation, work was resumed; the party arrived at the site on the 25th February, and encountered a tornado which considerably damaged the vessels.

One of the lighters, a small schooner, capable of carrying twenty-five to thirty tons of freight on four feet draught of water, was loaded with the portable hoisting-engine, derrick, tackles, shear-poles and a



small quantity of iron. The sea continued so rough that this load could not be landed until March 12, when a landing was effected through the breakers by means of small boats, and the derrick and shears erected on the platform. During the next sixteen days five more cargoes of iron were landed, and the first series of columns, girders, sockets and tension-rods placed in position.

It became evident from the slow progress thus far made, owing to stormy weather and the danger attending frequent landings through the breakers, that, unless a lodgement could be effected on the platform and the men be made to live thereon, the structure could not be completed within a year. Therefore, on March 29, the lighter was loaded with one month's supply of provisions, water, etc., towed to the platform and its freight landed; two large tents were set up on the platform, a temporary kitchen built, and twenty men left to continue the erection of the light-house. The advantages of this arrangement were very great. No matter how high the sea might be running, the men were there out of water, on a safe and steady foundation, and they could continue the work so long as they could be kept supplied with material.

The remainder of the force was employed in loading the lighter and steamer, and when the weather was favorable, in unloading the lighter at the platform. On days that were too rough to unload the lighter, all hands would land at the site in small boats, if a landing was practicable, and assist in erection. By keeping the lighter loaded and steam on the tender day and night, no available time was lost.

On June 15, 1878, the tower was completed and the light was exhibited.

The cost of this light-house was about $175,000.

Another advantage of this type of light-house is the quickness with which it can be erected. At American Shoals the ironwork was completed at the North, shipped to Key West, Florida, and the light-house completely erected and lighted in one year.

Both Fowey Rocks and American Shoals Light-houses are first-order lights, one hundred and fifteen and one-half feet high, and visible sixteen and one-fourth nautical miles.

There are several other light-houses of this type on the Florida Reefs, such as Carysfort Reef, Alligator Reef, Sombrero Key and Sand Key, all first-order lights, from one hundred and ten to one hundred and forty-four feet high.

Florida is rich in first-order lights; she has twelve in all, as many as Maine, Massachusetts, Rhode Island, Connecticut and New York combined.

NOTES OF TRAVEL.

CHICAGO.— III.[1]

Opera-house Building. Cobb & Frost, Architects.[2]

IT is interesting to note in these Chicago buildings the change in scheme from the time when elevators were hardly known, and the stairs were a very important feature of the building, to the new arrangement wherein elevators are, one might say, the key to the whole plan, and where the stairs are reduced to almost nothing. In such buildings as we are considering, the stairs are not used at all except in communication from floor to floor. There are some other points of arrangement which are also worth noting, not as being peculiar to Chicago, because they are involved in the construction of all buildings, but because they will at least show what is done. One is the relation between the first story and the grade line. Of the structures just considered, the Opera-House is entered directly from the street with but a single step. In the Munroe Street Building, and the Montauk Block, the first story is raised a few steps above grade and the basement is sunk a few more, so that the basement has high windows, but is below the grade. In the Home, the Pullman Building and the Rookery Buildings the basement is on a level with the street. Where practice differs so widely it is hard to say which is the best arrangement. It is a question that comes up with every new office-building that the architect has to deal with, and where owners and real-estate dealers differ so widely, it is not strange that architects should sometimes recommend one method and sometimes another, even under the same circumstances, but it seems as if the plans adopted in the Opera-House, the Rookery and the Home Buildings were, on the whole, the most satisfactory, and especially so in Chicago, where the nature of the soil will not admit of a deep cellar that can be of any practical value. Besides, we are inclined to think, judging from appearances, at least, that a building with a flush basement and first story entirely raised above the ground rents better and gives more satisfaction than one in which the basement is partly below grade.

Another question which is solved in many different ways is the height of stories. Without going into the consideration of all these

[1] Continued from page 315, No. 627.

[2] The author is indebted to the Editors of the *Inland Architect* for permission to reproduce this and the following cuts.

buildings, we will simply state that in the Rookery Building, the latest of its kind, the heights are eleven and twelve feet for the office stories.[1] In the Home and the Opera-House Buildings we believe the stories are somewhat less than this. The changes in arrangements of these buildings have been no more radical than the changes in the construction.

In a subsequent paper we will consider some of the problems involved in the foundations of these office-buildings. The construction of the superstructure is a chapter by itself, and we fancy an investigation of the methods in use in Chicago would be a revelation to every thinking man in the country. The old constructions of the period before the fire were slip-shod, flimsy, and in every way defective. Now, there can hardly be found better constructions, on the whole, than those of some of the Chicago architects. Their buildings are scientific in the manner in which the weights are distributed and the loads calculated, and are economical of space, money and light. Indeed, we are almost inclined to think that at present the most praiseworthy side of the Chicago architecture is its construction. Certainly there have been problems solved there that are never met with elsewhere, and what is more, they have been worked out in a manner that shows the most careful study and thorough appreciation of the conditions.

We have thus far considered the office-buildings only in relation to their construction and arrangement. It goes without saying that the buildings are grand and imposing. No structure can be erected covering the area that these do, and carried up into the air ten or twelve stories, without being majestic and awe-inspiring. We well remember our sensations on emerging from the Rock Island Railway Station one frosty morning. The sun had not yet penetrated the depths of the cavernous streets, and, walking up the avenue towards the Grand Pacific, with the huge buildings to the right and left and the great hotel looming up ahead, with its numerous chimneys and gables, the first turn bringing us face to face with the enormous Russian-like tower of the Exchange, the effect was overpowering, and completely annihilated criticism. Such structures seemed more than human, especially under the dim veil of the morning light, which revealed only their immense forms and shrouded their defects of detail.

One such building is imposing, but a whole street of such huge structures seems like the work of giants, and is too much to be comprehended in a day. The effect is hardly less stirring coming up La Salle Street from Monroe, with the huge blocks of the Rookery and the Home Buildings on the left, the Insurance Exchange, Maller's Building and others on the right, and the great tower of the Board of Trade looming right across the street at the end. It forms a picture such as can be found nowhere else in the world, and one feels very small indeed when undertaking to grasp the whole of such structures and weigh them and consider them in the mind. It is only after coming back to them day after day that one begins to appreciate them, to see how they are put together and how they are formed, and also to understand that these great creations had their beginnings in much smaller ways and on much lesser scales; that they are no less the results of growth than the more humble buildings, in size at least, of our own Boston. Mushrooms we might call them, considering their number and the rapidity with which they have been evolved. But there is nothing "Western" about these buildings; they were built to endure, just as emphatically as any of the structures which grace our Eastern cities or the capitals of Europe, and whatever one may say of their architectural excellence, no one can deny their impressive value.

Before the fire the German elements in design prevailed in Chicago much the same as they did in New York and do still for that matter, and a pseudo-Classic front, with panelled pilasters, string-courses at each story, and with arched, bowed and lintelled windows, was considered the correct thing. For many years the finest building in Chicago was assumed to be a structure called Booksellers' Row, an undefinable mixture of incoherent Classic and badly-mangled Gothic, neither pleasing in general effect nor tolerable in detail, but largely implying a feeling in style which one would characterize by the hateful adjective "Western" as applied to art. To the credit of Chicago the day of such buildings is entirely passed, though there are people so benighted as still to consider Booksellers' Row as one of the ornaments of the city.

All the older buildings were not so bad as this, however. Occasionally, some very successful designs were executed, successful, at least, in the mass, and now and then evincing a mastery of detail and choice of arrangement which give warning of better things to come. There are a number of old dwellings in Chicago, with wide, over-hanging cornices, too simple to be bad in detail and too straightforward to be awkward in expression. Unfortunately, such buildings are rare, and the new movement in art which has been manifested in the more recent buildings has almost taken the form of a protest against these old shams; against galvanized-iron, sanded to look like stone; against thin veneering to take the place of solid masonry; against the feeling that bad stonework was better than good brick, and against the general lack of artistic expression. The forerunner of the new work was a building, the name of which we do not recall, on the south-east corner of Washington and Dearborn Streets, designed by W. L. B. Jenney. This structure is built almost entirely of brick and terra-cotta, and was a revelation to a great many of the Chicago architects. Mr. Jenney, we believe, had studied at Paris and came to Chicago as a comparatively new man when he erected this structure. In the light of subsequent achievements, it might be criticised as somewhat boxy in treatment and unnecessarily emphatic in structural manifestations, but on the whole, it was a very successful building, especially so for the time when it was erected, and is still one of the good, first-class office-buildings of Chicago.

It is interesting to compare this building with the latest work of Mr. Jenney, the Home Insurance Building, the plan of which we have previously considered. Externally it is a ten-story structure, simple and straightforward in its character, built almost entirely of brick, with the ornament used very sparingly, but, on the whole, well and in a judicious manner. The style of the building is Classic, but not pronounced in detail, with each story marked by string-courses, and a bold cornice crowning the whole, the pilasters running up between the windows and being continued to the top. The chief charm of the building is in the interior, which is certainly the most successful of its kind in the city. The vestibule on the La Salle Street front extends through two stories and is finished in polished white marble, with the columns supporting the wall and the stair-work, including rails, the posts and the elevator-screens, all in dark bronze. The vaulted roof of the vestibule is of marble slabs, supported on bronze ribs. The elevator-screens are very light and graceful in structure, and being arranged as they are, directly opposite the entrance, with the broad stairs winding up from the first story, and the passage underneath leading directly through into the basement-corridor, the effect is exceedingly pleasing. The entrance-portal is carried up with a broad round arch, the top of which is filled with an elaborately-wrought grille of iron, very light and graceful in its character and forming a perfect picture in combination with the dark bronze and the white marble of the vestibule. Mr. Jenney has shown great taste in the treatment of the interior of the building throughout. The walls of the corridors are tinted a pale salmon. The dados and floors are of white marble and the ceiling is a pale buff. The woodwork, which is confined almost entirely to doors and architraves, is of pale oak, and the elevator-fittings and stair-rails throughout are bronze. It seems like an expensive building, but when we consider how charming the combinations of marble and bronze and tinted plaster are, it would seem worth while to pay more to be in such a building than to have to put up with the blank walls and dreary corridors of even so good a building as the Opera House.

Diagonally opposite from the Home Insurance Building is the structure known as the Insurance Exchange, a sketch of which we publish herewith. This building was erected by Burnham & Root, and as an example of pure brickwork, it is one of the best in the city, if not in the country. We certainly know of none other where simple red brick has been used with such a breadth of treatment both in the mass and detail, helped out only by such terra-cotta as is needed for sills and lintels. It is kept quite plain, the only ornamentation in foliage or carved-work being about the entrance. Everything is dark cherry-red, except the relatively low basement of granite. In the Home Building there is no perceptible attempt at grouping the stories in height, but in the Insurance Exchange a very successful endeavor is manifest to diminish the extreme height of the building by grouping the stories together. The basement is of stone. The first story has simple round arches and plain piers; the two stories above are treated as one, the piers being carried up through, with panelled backs between the stories. Then follows a single story, and above that are four stories grouped across the front in three divisions, and finally, the upper story is treated by itself, and a simple projecting cornice and parapet crowns the whole. The corners are very emphatically marked by wide piers, a scheme which we should fancy would meet with sharp opposition from real-estate agents, but which somehow, seems to be very often adopted in Chicago buildings. Nothing can give so much character and dignity to a building as such treatment. The lack in most office-buildings is in wall-spaces. Of course, it is impossible to have much of this where so much light is required, but by massing the wall-spaces in four broad piers, as has been done in the Insurance Exchange, a very pleasing effect is obtained without any real sacrifice of light to the interior. The corners of the buildings are further marked by bold turrets, which recall the work on the apsis of the Albi Cathedral, and are very satisfactory in effect. A very clever device is adopted in the spandrels above the eighth-story windows and on the walls of the attic. The brickwork is laid with very strongly marked horizontal lines formed by projecting every alterate course of brick, so that the effect is to give an appearance of a different texture to the wall, though the material is, of course, the same. As the height is so great above the ground, one cannot see the coarseness of the device, and the result is only a pleasing appearance, similar to that of the rough-surface paper on which artists so delight in making water-colors. This gives a very decided character to the building, and by carrying these lines up to the arches above the eighth and ninth stories, the circular-topped motives are brought out and made to show for all they are worth. The whole design is admirably balanced, and the effect of color is quite pleasing, though one is tempted to question whether the building would not have been far brighter and pleasanter if the sashes had been painted white instead of black. The problem is thoroughly handled, and the scale of the building carefully preserved. It is large and high but not feeble, and solid and substantial without being clumsy. The interior of

[1] The exact heights from top to top of the stories, beginning with the cellar, are 8′ 8″, 11′ 8″, 17′ 6″, 12′ 6″, 14′ 4½″, 12′ 6″, 12′ 6″, 13′ 9″, 12′ 6″, 17′ 6″, 19′ 6″.

this building is not at all good. It is dark, with some very bad scagliola in the vestibule, quite in contrast to its neighbor the Home Building.

The Opera House-Building is an exceedingly practical building; in fact, it is nothing but a big box, pierced with square holes. It is said to be very well built, and is certainly very satisfactory in arrangement, but one cannot but wish it were treated in a more artistic manner.

Burnham & Root, who are among the most progressive architects in the city, have twice attempted a feature of exterior design which is certainly interesting, though it can hardly be said to be successful. In the Rialto Building, as well as in a small structure opposite it on Pacific Avenue, the exterior walls are built with a pronounced batter or are diminished by external offsets, becoming visibly thinner and lighter as they ascend. This is, of course, a mere trick, and is by no means an essential element of character in design. A building to be

J.B.MALLERS·OFFICE·BUILDING· J.J.FLANDERS·Arch.

truthful in character need not show all it has, nor exhibit every detail of its construction, and although in these two buildings the architects have made a great deal of the scheme attempted, the result does not seem to justify the means. The greatest wonder in our mind is how Burnham & Root ever persuaded a client to sacrifice the amount of office-room implied by such a device.

The Rookery Building is, all things considered, the most satisfactory of the Chicago office-buildings. A great deal can be said against it, but there is so much that is good in detail, that it easily holds its place as the best designed structure of its kind. It is built entirely of brick, a favorite material with the Chicago builders, but, unfortunately (we say "unfortunately" advisedly) the brick is a dark chocolate color. Had the same forms been followed in the strong cherry tones of the Insurance Exchange, which is directly opposite the Rookery, we believe the results would have been much more pleasing. The lower story of the Rookery is built of very dark granite, with heavy piers alternating with polished shafts of dark, speckled granite or marble. All above the first story is of brick and terra-cotta. The grouping is, first, two stories together; then a wide string-course; then three stories with round arches at the top; then three more stories with similar arches. Above this is a wide corbelled band, and an attic story with square openings. In detail, the work recalls the Spanish-Moorish brickwork, though a considerable Romanesque feeling is introduced into the style. The piers are rounded throughout, the corners of the building are rounded; the archivolts are rounded, and the round-arch feeling predominates in the whole design; but in the diaper-work and in the details, in the outlines, in the turrets which mark the corners, no less than in the wide projected bays over the entrance is there a strong Moorish feeling. The detail is coarse, rather too coarse, it seems to us, but perhaps not so when we consider its relations to the whole enormous bulk of the building. Delicate detail would be impossible in such relations, and although the crudity of some of the work grates on one at first, it may be questioned whether it is not, after all, in keeping with the rest of the building. Certainly, the design is handled in a masterly way in spite of the enormous size to be treated. The entrances are well wrought out, with good lines and just enough emphasis to make them central features, without unduly pronouncing their independence from the rest of the design. If the same design were carried out in stone, it would be overpowering. In brick even, it is massive, ponderous and imposing, in spite of petty details and sharp, crude carving. It is a design which grows on one, immensely, and has the advantage of showing up well at all points. One would wish the lintels over the lower bays were more massive, and more depth would, perhaps, be better for the arches above. The building looks somewhat as if it needed more height, and had been intended to be higher, but had been crowded down, and the arches rather squeezed in between the stories. It is always a difficult problem to work in round arches of such span as is necessitated in a building of this kind, especially when the height of stories is kept so nearly the same throughout, and the arch is obliged to cut into the windows; and the

OFFICE BUILDING FOR L. P. HANSEN—JOHN ADDISON, Architect, Chicago.

effect, especially in the sixth story arches is as if there were not quite breathing-room enough, as if the arches had settled down and should have been broader and wider in their spring.

All the buildings are not so successful as the Rookery, either in mass or detail. We present this, two buildings, the Maller Building, remarkable for its extreme height of thirteen stories on the street, which is rendered even more pronounced by the multiplicity of vertical lines and the long bay on the corner. Also the building for L. P. Hansen on Dearborn Street, by Mr. Addison, a very clever bit of work in a style which apparently has not found much favor with the more recent office-builders, a semi-colonial or classic style.

All the foregoing buildings are the work of Chicago architects. In marked contrast to these is the recently erected building for Marshall Field & Company, from the design of H. H. Richardson, a simple, quiet, unassuming structure, looking like a little Quaker in its simplicity, being contrasted with the gorgeous, overpowering buildings all around it, but none the less pleasing and satisfactory for itself. Then there is the Board of Trade Building, a more or less satisfactory structure of which there has been very unfavorable comment at times, but which has a great deal of grandeur in effect; and, besides, there are very numerous office-buildings scattered all over the city, the mere enumeration of which would take up more space than is at our disposal. The buildings we have considered, however, will serve to illustrate the present condition of the work in Chicago. It is but fair to say that there has been, as yet, no real style developed. Each building is a law unto itself, and no architect

seems to feel called upon to follow even his own precedent, either in the choice of design or the character of the detail. There seems to be, throughout, a restless striving after originalty; a seeking for striking effects, which, while interesting, is not always good, and generally serves to belittle the character of the architecture. But the mass of these buildings is generally good. The problems attacked have been met openly; there has been no dodging, no avoiding of necessities, no striving to work-in blind stories or false pediments, and the ideas adopted have been worked out to final conclusions as far as was consistent with the circumstances; so that with all these buildings there is evidence of mental activity. The chief faults lie in the details. The ideas are good, but the Chicago architects will pardon the suggestion that the designs sometimes seem to call for more careful study; that there is a lack, possibly intentionally, of delicacy in the treatment. The designs are handled with too free a hand. Still, with all the life and vigor and thought which has been manifested, one cannot wonder at the crudity of some of the ideas, and the coarseness of some of the details. It is far better to be bold, even to brutality in treatment, than to be refined to weakness. There is always hope from such vigorous, architectural life as is here displayed, and these noble buildings demonstrate Chicago's claim to an honorable position in the national art-life.

C. H. BLACKALL.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

WESTMINSTER PALACE. AFTER AN ETCHING BY FELIX BUHOT.

[Gelatine Print issued only with Gelatine and Imperial editions.]

THE imposing river front of Sir Charles Barry's greatest work has been etched by other hands beside those of M. Buhot. His print ranks in size (our copy is about six inches shorter than the original) between Whistler's small plate of "Westminster Bridge" and Mr. David Law's large etching of the Houses of Parliament. While not equal in the highest artistic qualities to the former, it is a strong, assured and effective piece and much nearer allied to the work of Whistler than of Law. In this, as in others of his etchings, Buhot has surrounded the central picture with a margin of fanciful sketches which on a little careful inspection are seen to bear a sympathetic relation to the subject. Among them we recognize the Westminster Column; the statue of Lord Beaconsfield in Parliament Square; and various "bits" relating to the state, the city and the church. There are the arms of England and the Speaker's mace; the Lord Mayor's coach and state barge, with two or three London sparrows; and a kneeling female figure which suggests Elizabeth Woodville, Queen of Edward IV, taking refuge in the Abbey Sanctuary.

Buhot was born some forty years ago at Valognes in Normandy, a quaint old town once both wealthy and busy, attributes which it has long since lost. He studied under two teachers of the first rank, both more renowned for their pupils than for their own works — first, Lecocq de Boisbandran, the master of Lhermitte, of Fantin-Latour, of Legros, and of Guillaume Regamey; second, Gaucherel, who taught such etchers as Rajon, Courtry and Lalauze. He has never sought for his work any official endorsement which we believe in his case has been limited to a third-class medal, received in 1880. He is independent and modest, which together with the fact that his work requires some study before it can be fully appreciated, has probably prevented his name and productions from being as widely known as they should be. For it is still true that the most popular art is the shallowest. Buhot served through the Franco-Prussian War under General Chanzy, and afterwards taught drawing at Paris in the College Rollin, until having introduced some innovation in teaching not approved by the governing professors he abandoned this and relied only on his own work for support.

M. Philippe Burty in a recent [illegible] speaks of some plates which Buhot etched from Japanese objects in his [Burty's] collection and compares them favorably with the work of Jules Jacquemart, whom Hamerton has called "the most marvellous etcher of still life who ever existed in the world." Buhot has also etched, from his own designs, illustrations for several of the novels of M. Barbey d' Aurevilly, one or two portraits, some cups and vases made by the goldsmiths Froment-Meurice and Christophle and reproduced several pictures by other artists. But the great bulk of his work is from Nature — studies of donkeys or geese, scenes of Parisian street-life, landscapes in his native Normandy and some English subjects — on the Thames and at Folkestore or at Hastings. His etchings are powerful and expressive and show a keen eye for beauty in Nature and character in people. He uses all the resources of the etcher in his plates and makes many changes, the last states generally being an improvement on the first. He controls all his plates and is an enthusiast on the subject of paper, printing and proofs. Those he thinks the best he stamps with his device — an owl between the initials F. and B., in red. The proof from which our reproduction is taken bears this device, with Buhot's signature. An exhibition of etchings and drawings by this painter-etcher is now open at the gallery of Messrs. F. Keppel & Co., of New York, to whose kindness we are indebted for permission to reproduce the "Westminster Palace."

FOWEY ROCK LIGHT-HOUSE.

FOR description see article on "Ancient and Modern Light-houses" elsewhere in this issue.

THE UNITED STATES COURT-HOUSE AND POST-OFFICE, WILLIAMSPORT, PA. MR. W. A. FRERET, SUPERVISING ARCHITECT, WASHINGTON, D. C.

Y. M. C. A. BUILDING, SAN DIEGO, CAL. MR. ERNEST A. COXHEAD, ARCHITECT, LOS ANGELES, CAL.

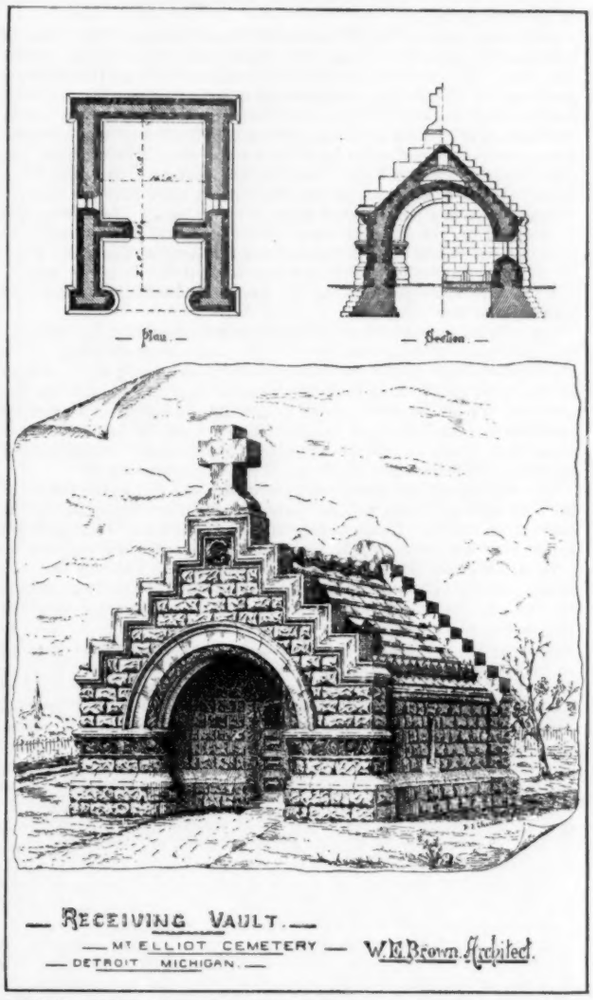
THE estimated cost of this building is $60,000.

STORE FOR MESSRS. DE COSTER & CLARK, ST. PAUL, MINN. MR. J. W. STEVENS, ARCHITECT, ST. PAUL, MINN.

STORE FOR MR. M. E. MAYALL, ST. PAUL, MINN. MR. J. W. STEVENS, ARCHITECT, ST. PAUL, MINN.

CHRIST CHURCH, HERKIMER, N. Y. MR. R. W. GIBSON, ARCHITECT, ALBANY, N. Y.

SOME GENERAL OBSERVATIONS ON THE STRENGTH AND STABILITY OF MASONRY. — I.



HERETOFORE experimental investigation, into the strength of building stones, cements and mortars, has been directed chiefly to the determination of the ultimate resistance under tensile or compressive stresses, neglecting for the most part observations on the compressibility of the material. This has been a very important omission, for without knowledge of the behavior of the component parts under stress, it is, of course, impossible to so proportion a structure that each part shall carry its share of the load, and the result generally reached is that some parts are seriously overstrained while there is a corresponding understraining elsewhere. Examples of this kind are of frequent occurrence in architectural work, and the unequal distribution of stresses are made manifest by the development of visible defects to such an extent that it is difficult to choose

a position on any of certain streets of Boston from whence some defect or defects in the buildings cannot be plainly seen. And this is not a matter of merely local interest, the causes which have produced these results are present in other cities. For the most part these defects consist of cracks of limited extent in the exterior walls, and are not at all serious so far as endangering the stability of the structure, but they certainly mar its appearance, which is serious from an architectural point of view. One of the largest apartment-houses of the city, located in the Back Bay district, furnishes a recent example where the injury of the walls reached such proportions that expensive repairs became a necessity to prevent its entire destruction. The beautiful stone arch at the Back Bay has, in the haunches, two large cracks in sight.

It is unnecessary to enumerate many instances of this kind, as a cursory inspection will show that defective structures are more numerous than generally supposed.

Instances are very rare, however, where masonry has failed from extended crushing of the material, and there need be little anxiety in the use of ordinary building material, provided care is taken to make available any considerable portion of its strength.

The crushing strength of masonry largely exceeds its tensile strength, and, presumably, also its shearing strength. The engineering problem is to employ the material in its strongest direction, and secure an even distribution of the loads which are to be sustained.

There is no reason for believing that this end cannot, in a measure, be attained, and, without interfering with their architectural effects, buildings of brick and stone be constructed, which shall remain free from those almost omnipresent cracks which cause such disfigurement at the present time.

Referring now to the Watertown Arsenal tests of this class of constructive material: Tests have been made upon cubes, prisms and piers. The material to be tested is placed between the flat steel platforms of the testing-machine, the bearing-surfaces having been faced with a thin coat of plaster-of-Paris, when necessary, to obtain flat faces, and thereby secure a uniform distribution of the compressive stresses. Experiments have been made with other cushions, but plaster has given the highest results, and, therefore, the most satisfactory, because the material will not sustain more than its true resistance, and may fail in detail under a lower load. The advantages of the use of plaster were soon recognized, and for a number of years passed it has been in general use for tests of this class, when the faces of the material were not true without it. It is not imperative that the bearing-surfaces of the test-piece should be parallel, only that they be flat.

An adjustable platform of the testing-machine enables the distribution of stresses to be accomplished with great nicety, avoiding eccentricity of loading. Under such favorable conditions very high strength is displayed, and it should not be expected that in practical use the material will be found so strong as the tests indicate, on account of probable eccentricity, the unequal distribution of loads and the absence of reinforcement in strength, which comes from the friction of contact with the rigid platforms of the testing-machines.

The rigidity of the platforms is, however, less felt as the height of the specimen increases, and this influence doubtless disappears in the tests of tall piers. Loads are gradually applied and increased till rupture occurs, before which time cracks generally, although not invariably, appear. If the material is structurally uniform and the loading evenly distributed, we should not expect the cracks to appear till the maximum loads were reached, and it is commonly observed that strong specimens of their class do not show cracks so early as weaker ones. Occasionally material is tested which gives warning of impending fracture only a few seconds before it bursts into fragments; such behavior not being confined to any particular kind of stone, it having been met in sandstones, limestones and granite. When cracks occur from want of uniformity of material, it is seldom they appear under loads lower than sixty per cent of the ultimate strength; if from uneven distribution, there is no predicting how low the load may be. It is not to be understood from this that an uneven load will cause rupture, unless at some places it is sufficiently intense to overcome the resistance of the material; it really requires, in this case, locally, a higher stress per unit of surface to cause rupture than would be required if the entire surface was acted upon.

The principal fragment of a cube is pyramidal in shape, or there are two pyramids developed, their bases being formed by the compressed surfaces, and their apices facing or overlaping. Truncated fragments result when short prisms are tested. A pier, composed of several prisms of the same cross-section dimensions as the pier, fails in a similar manner, with the truncated pyramidal development, the planes of fracture extending through the prisms apparently uninfluenced by the presence of the joints. Long prisms fail with fractures taking oblique directions. In all these cases it is seen that separation results from fractures which take a shearing direction.

The manner of failure of brick piers has been described in a previous article.[1]

After fracture very little cohesion remains between the particles composing sandstones and marbles, the fragments readily crumble under the pressure of the hand. Slates, granites and conglomerates have stronger fragments.

When single bricks are tested the material is well disintegrated, but not generally so with piers, where few bricks are really crushed, the principal fractures separating the piers into columns of half bricks, the result of shearing and transverse stresses.

While under stress the material is compressed, which it recovers from wholly or in part when the load is removed.

With some stones the recovery, within our limits of observation, is perfect even after the release of loads nearly approaching the ultimate strength of the material. Loads very near this limit, however, cause a rapid increase in the rate of compression, the material takes a permanent set and is soon followed by rupture.

In other specimens permanent set is detected after the release of comparatively low loads, the sets increasing in magnitude with the increase of stresses.

In computing the mechanical work of rupture, the total compressibility including the set would enter as a factor, but in the computation of the modulus of elasticity the sets are deducted, only the resilience of the material being used.

The modulus of elasticity of steel in bars, differing in both their chemical composition and mechanical treatment, is much more uniform than this property in different stones, and whereas in steel the modulus of elasticity is uniform for loads within the elastic limit of the metal, but this is not always so with stones, which fact makes it the more difficult to predict in certain cases what the stresses will be in the material.

In reviewing the behavior of certain natural stones, cements, concretes and mortars, examples are found in which the modulus of elasticity is uniform over a considerable range of loads, also cases where the modulus diminishes in value and cases where it increases in value as the loads are increased. Why the modulus of elasticity of a material should have a particular value, of course, no adequate answer can be given, but when variations are found it is an object of special interest to ascertain, if possible, concurrent changes in other properties. An investigation of this kind has not yet been undertaken with reference to changes in the modulus of elasticity of stones. It might, for example, throw some light on the subject, and in any event would be interesting to determine the volume of the material while under different loads.

These observations supplemented by others, on the absorptive qualities, and such chemical tests as are thought to indicate best the relative durability of the material under climatic and atmospheric influences, such observations might enable us to attach further significance to the changes in the modulus than mere reference to the distribution of stresses.

It is further desirable to extend the investigation to the effects of seasoning on the physical properties of stones.

In regard to the elastic limit, this feature is not very well defined, or else it coincides with the ultimate strength. If a strict definition of the elastic limit were adopted and no permanent sets admitted, some stones would have a very low elastic limit, although many of the sets would be of small magnitude and difficult to identify without the aid of a micrometer. If, on the other hand, the elastic limit is assumed to be reached when there is a decided increase in the rate of compression then that limit is only reached, at times, when the loads approach very near the ultimate resistance of the material. Some stones have been found, however, in which there was no appreciable set until high loads were reached, the elasticity was seemingly perfect over a wide range of stresses.

After permanent sets begin to appear, it frequently happens that the second application of a load will compress the material more than the first application, and, further, the full effect of a given load is not always immediately felt, but after it has acted a short time when there is found additional compression. The same with reference to sets, there is often a slight additional recovery which takes place soon after the principal recovery which immediately follows the release of the load. This behavior is not known to possess any peculiar significance beyond indicating the probable existence of a certain amount of friction between the particles which is sluggishly overcome, but such behavior, which is more pronounced in iron and steel than in stone, naturally suggests an inquiry into the causes which lead to overcoming the ultimate strength of the material.

We observe that stress produces a certain relative displacement of the particles, and that the displacement increases with the stress, until finally under the combined influence of stress and distortion the force of cohesion is overcome and rupture ensues.

Whether the responsibility of rupture belongs chiefly to the stress or the accompanying distortion, it is difficult at the present time to say, although there are reasons for believing that stresses under some conditions will not produce rupture nor serious loss of cohesion. For example, the pressure sustained by deeply buried rocks would cause rupture and disintegration if the pressure were received in one direction only and opportunity offered to yield in other directions. Yet such rocks as have reached the surface are strong. While we thus proceed in the direction of ultimate rupture by increasing the distortion, it does not follow necessarily that rupture will occur till there is a definite amount of distortion or displacement of the particles, which displacement will depend upon the quality of the material, and any disturbance short of this may or may not affect the ultimate resistance, we cannot speak positively in regard to this without further investigation.

By means of cubic compression intense pressures may be applied with the minimum distortion of the material, as there will probably be some change in volume under stress, but conversely distortion cannot be effected without stress.

[1] "The Crushing Strength of Brick Piers." *American Architect*, August 13, 1887.

It has been remarked that local stresses are required of greater intensity per unit of surface actually acted upon to produce rupture than would be required if the entire surface was uniformly loaded, the reason for this being the reinforcement in strength due to lateral attachment, the loaded section having to be crushed and also detached from the surrounding material. Such is a general statement of the effects of stress on these materials. J. E. HOWARD.

ELECTRICITY AND SEWAGE.

CAPITAL FROM DEERHURST CHURCH.

ELECTRICITY, which has served so many purposes in science and in the arts, now promises to rescue civilization from one of the most pressing difficulties which beset it. The Metropolitan Board are about to expend a sum of nearly or quite a million sterling in purifying the London sewage, so that the Thames shall be delivered from its present state of pollution. The process to be employed is of a chemical nature, and enormous works for the purpose of carrying out the project are in course of construction at Barking, to be followed by others of a similar nature at Crossness. At this juncture, a plan of an entirely novel character is being perfected, which has the appearance of dealing successfully not only with the whole sewage problem, but also to a large extent with the question of water-supply of towns.

The plan has been devised by Mr. William Webster, F. C. S., son of the well-known contractor who has had so large a share in executing the drainage works of the metropolis. For certain reasons connected with the Patent Office, it would not be fair to the inventor to enter at present into all the details of his process, but certain results can be stated which will establish the importance of the undertaking. A current of electricity, produced either from cells or from a dynamo, is sent into the sewage, the transmission being effected through metallic electrodes. Instead of casting chemical ingredients into the sewage, the inventor adopts the plan of creating his chemicals in the sewage itself by the action of the electric current on the electrodes and on the sewage.

The effect is curious and is well seen when the liquid is exposed to view in a glass vessel. An inky fluid, obtained from the Deptford pumping-station of the Metropolitan Board, has all its particles set in circulatory motion by the electric current, a kind of procession taking place from the top downwards and from the bottom upwards. The sum total of the movements consists in landing the suspended particles at the top of the liquid, thus exactly reversing the usual chemical process, which sends everything down in the form of a precipitate. The upward action is due to the presence of certain gases, at first extricated by the electric current, and afterwards mingling with the organic matter, so as to give buoyancy to the latter. By agitating the liquid, the gases can be sent off into the air, and the solid particles will then descend to form a precipitate, showing no tendency to permeate the liquid as before.

But, as will be shown presently, there is no need to effect this precipitation. So prompt is the effect of the electric current that in the space of twenty minutes a volume of opaque sewage becomes perfectly transparent, except at the top, where the organic matter collects in a semi-solid form. A sample which we saw thus treated presented at the close a somewhat milky aspect, apparently due in a large measure to the presence of chalk, the Deptford sewage being impregnated with the water-supply of the Kent Company, derived from deep wells in the chalk formation. Some portion of the cloud might also be occasioned by suspended clay. But the tint was slight, and the contrast exhibited before and after treatment was of a most striking character. It should be added that no offensive odor was perceptible.

It is claimed for this process that it effects the removal of all the solids in suspension in the sewage, and also the greater part of the matters in solution. In actual practice on a working scale, the separated portion floating at the top of the sewage can be run off by one channel and the clear water beneath by another. Mr. W. Webster has carried his experiments beyond the mere bounds of the laboratory, but is anxious for a more extended test, so as to establish the character of his process beyond doubt.

Of course, the element of finance comes in. For this purpose certain data are already available, and these are so far of an encouraging nature. From the results already obtained, it is calculated that the cost of the electric current for treating the entire volume of the London sewage, north and south, would be about £25,000 per annum. This sum represents the working expenses, and compares with the cost of the chemicals employed by the Metropolitan Board in their treatment of the sewage. The annual outlay for chemicals when the plant comes into full operation is expected to be £18,000 for lime and iron, and £12,000 for permanganic acid, thus making a total of £30,000 per annum. Accordingly, so far as estimates go, there is a balance in favor of the electric method. But in the latter instance there is the advantage of a purer effluent, as also of a quicker process.

It may be asked, what is to become of all the expensive works now in course of construction at the Barking outfall if the chemical method is at the last moment to be superseded by another of an entirely different character? Is the contract sum of four hundred and six thousand pounds to be absolutely thrown away? Happily, the contingency is not quite so bad as this. Mr. Webster's plan, after all, is partly chemical in its action, only it happens that the chemical process is set up by the electric current. Tanks will be required for the reception of the sewage, and much of the Barking plant will be of service in connection with the new process. The most urgent question is that which has reference to Crossness. The tenders for the works at that spot have not yet been invited, but the plans are understood to be complete. If the electric method is discovered to be preferable to the chemical, the Crossness works ought to be constructed in strict conformity with the requirements of the former.

A peculiar feature to be contemplated is the very small addition which the electric method makes to the solid residuum. No chemicals are introduced into the sewage, except the small quantity thrown off from the electrodes. This may be reckoned at a grain per gallon, amounting, in the immense volume of the London sewage, to ten tons per day. But the chemical method requires rather more than three and a half grains of lime and one grain of proto-sulphate of iron, besides the permanganic acid. The lime thus represents thirty-seven tons per day, and as the solids in the precipitated matter are always accompanied by an enormous quantity of water, every ton added to the former is multiplied in the quantity which has to be dealt with in the form of "sludge." There will, therefore, be much less to remove in the semi-solid form by the electric method than by ordinary chemical treatment, although the former extricates all the solids in suspension. To remove the sludge produced by the chemical plan hitherto approved, the Metropolitan Board contemplates building five steamships, costing £16,000 each (one being already afloat), unless, in the meantime, the farmers show a disposition to receive the sludge for the purpose of fructifying their crops. The sludge produced by the electrical process will have the advantage of possessing some of the ammonia previously held in solution, and will be so much the more valuable.

Mr. Webster's electric plan for the treatment of sewage has already been exhibited in an experimental form to Sir Joseph Bazalgette and Mr. W. J. Dibdin, the latter being the chemist to the Metropolitan Board. Other scientific authorities have also seen the experiments, and enough has been demonstrated to gain for the new process a respectful consideration, if not something more. In all probability the Metropolitan Board will proceed at once to inquire into the merits of this remarkable process. All may be said to depend on its financial aspect. It may be considered a proved point that electricity can be made to effect a perfect purification of sewage. If Mr. Webster fails anywhere, it will be in the question of cost. The working expenses may have been correctly calculated, but interest and redemption of capital must also be taken into account. Steam-engines will cost a large sum and dynamos are expensive, although doubtless capable of being cheapened.

With respect to the question of the water-supply, Mr. W. Webster has applied his plan with great success to the purification of water intended for drinking purposes. The filtration of the Metropolitan supply costs the London water-companies at the present time nearly sixteen thousand pounds per annum. It will be a singular transformation if their filter-beds should be superseded by an array of electrodes. — *London Standard, January 7.*

BOOKS AND PAPERS.

IF the forthcoming biography of Henry Hobson Richardson prove to be as worthy a memorial of the man and his work in its fulness of detailed information as is the last of the "*Monographs of American Architecture — Trinity Church*," there will be much cause for gratulation. In some ways it is a pity that the two could not have been combined, for the "*Trinity*" has suffered through the impossibility of procuring for it those illustrations — almost within reach — which would have made it really complete. The feeling on the part of those who have the biography in hand — a perfectly natural one — was that readers would look to it for fresh and unknown information and illustrations not otherwheres procurable, and that, therefore, the drawing of the new Galilee porch, which is to complete the western façade, and which Mr. Richardson had only definitely decided upon within a year before his death, must not be publicly seen except in the biography. The same feeling made it impossible to obtain for the "*Trinity*" the original competitive drawings which secured the work to its authors, and the several studies that preceded the design which was finally carried into execution. But, though these "rejected addresses," and the somewhat remote possibility of the new western porch, may be dimly missed by those who think of their existence, yet such an idea would occur to few who see how thoroughly the noble building is exhibited by this remarkable series of plates. We call them remarkable, for any one who knows even a little about photography will know that it was no mean achievement to procure a single interior view of such a building, while in this collection there are half a dozen interior views

which are perfect specimens of successful photography; the view of the chancel and the interior of the great tower looking upwards being especially notable.

There are two plates which will attract most attention, one the portrait of Mr. Richardson, who is here shown in what looks like a disguise for a fancy-dress ball, but which those who know the semi-invalid condition against which he so long struggled, and also recall the eager and nipping airs that drew through his great study and its adjoining work-rooms, will recognize as a hooded dressing-gown from which he extracted much solid comfort. It has all the effect of intention, however; as if feeling that he was working in the same direction and along the lines of the old monkish freemason, he had come to believe that if clad as they were, he could better understand how they would solve the problem before him, and so secure that consistency for which he always strove. The great emphatic autograph below is full of character, and scales with the man. The grim face and the set mouth give a hint of the spirit which rode down all obstacles animate and inanimate that stood in his way. One feels that this is the architect, the builder, but it gives no glimpse of the man whose social powers and *bonhommie* made him the most entertaining of hosts, the most amusing of acquaintances.

The other plate which attracts attention is the colored print of the building from the east, the view which is most typical and most satisfying. As a piece of color-printing it is a most successful and accurate work, and adds immensely to the value of the work by exhibiting truthfully the colors of the materials used in the building. If the same process could have been applied to some of the interior views, the gain would have been great: that it was not, could not have been because of any shortcomings in the possibilities of the process, but because the publishers were unwilling to make the work so expensive as to be out of reach of those who only carry modest purses.

It gives one a shock to find on the title-page Mr. Gambrill's name as architect with Mr. Richardson, whose name alone has for many years been associated with the building, and we cannot help feeling that he was spared many a pang by not living long enough to discover how completely it was forgotten that he had ever had anything at all to do with the church. We have heard it whispered that Mr. Gambrill's untimely death was, in some degree, brought about by his chagrin at finding his partner was in the public mind more intimately associated with the work done by the firm than he felt was just and proper. However this may be, we are glad that, through what would have been an excusable piece of carelessness, Mr. Gambrill's name was not forgotten.

The worthiness of Philibert de l'Orme[1] to occupy a portion in the heirarchy of great architects, must now be taken a great deal upon faith. His contemporaries speak of him as the equal of the great Italians of the Renaissance period; and although he constituted himself their rival, and was a thorough *chauvin*, there is no reason to doubt the justness of contemporary opinion. Indeed, the fragments of his work which remain, prove the judgment of his friends to have been correct. Unfortunately, very little remains. The Tuileries was partially destroyed by the Communists, and party feeling has caused the ruins to be pulled down. However much we may sympathize with the desire of the French Republic to destroy all the remains of former despotisms, we cannot but feel that the destruction of a palace will not prevent the return of a monarch. Plenty of suitable lodgings remain for the sovereign should he ever want them. The pulling down of the ruins of the Tuileries was the action of carping vandals — as well might they destroy Versailles, the Trianon, Pierrefonds and even the Louvre, for they were all built by despots, and architecturally, they do not possess the merits of the Tuileries. That the latter was too much wrecked to be rebuilt is far from the fact — it was no more so, than many other buildings; and *had* it been restored, it would have put an end to the endless discussions as to what to put in its place. A new building would not be in harmony with the Louvre; and without a building, the Louvre looks mean, isolated as it is in so much space. The Champs Elysées and the Louvre are not in a direct line, and now that the old palace is gone, this defect is only too evident — this probably is the reason that the whole space is still occupied by shanties such as I imagine might be seen in a new squatting in the far West. But patriotism seems sometimes to run away with taste and artistic feeling, and common sense; and, consequently, if you want to study Philibert de l'Orme's building, you must go to the Trocadéro Garden, where you will find two doorways — all that has been preserved. Monseiur Vachon claims for French artists, many of the buildings hitherto forming the reputation of the Italians; and he considers de l'Orme's great merit to have been, raising the character of French art; that is to say, Frenchifying the Italian Renaissance. Thus M. Vachon: "*Toutes les grandes œuvres architecturales, toutes les merveilles d'art, dont elle (la Renaissance) a couvert notre pays, étaient attribuées presque exclusivement aux artistes Italiens que Charles VIII, Louis XII et François I avaient amenés en France. Vignole avait bâti Chambord, qui est de Trinqueau et Jean Marchand; Giocondo, Gaillon, l'œuvre collective, incontestée aujourd'hui, de Guillaume Senault, Pierre Fain, Pierre Delorme; le Dominique de Cortone, dit le Boccador, recevait exclusivement tous les honneurs de la construction de l'Hôtel-de-Ville de Paris, que j'ai tenté de restituer à ce glorieux méconnu, Pierre Chambiges. A Serlio nous devions Fontainebleau et Saint-Germain-en-Laye, dont les vrais architects sont ce même Chambiges et Gilles le Breton.*"

Philibert de l'Orme was born about the year 1515. He styles himself "*Lyonnois,*" and puts this, his birthplace, before his honorary titles of "*Conseiller et Ausmonier du feu roy, d'abbé de saint Eloy de Noyon.*" His father sent him to Italy when very young to study the great masters' works; and at Rome he seems to have entered the Pope's service for a time; but in 1536 Cardinal du Bellay made him return to France, and he began building for Général de Bretaigne in Lyons. A document discovered in 1858 in the Bibliothèque Nationale informs us that he was named architect to the king, and in this capacity he seems to have been engaged in inspecting the fortresses of Brittany. Curiously enough, he not only found the castles and fortifications wanting repair, but the finances in confusion, and he set to work to put both in order. Nor was he wanting in energy, diligence and vanity; for according to his own account, had it not been for him, the English would have taken Brest. As it was he mounted all the available artillery, and painted false guns on the ramparts to deceive the enemy; he got together some of the inhabitants as false soldiers, and setting up pikes without men, thus frightened away the enemy.

In 1548 he was nominated Inspector of the Royal Palaces, and was given the revenues of several abbeys. But his natural pride, his vanity and his love of reform; his rigid honesty, his avarice and his desire to prove his contemporaries guilty of robbing the State gained him many enemies in spite of the protection of the king and his favorite, Diane de Poitiers. Bernard Palissy spoke of him as "*un architecte françoys qui se faisoit quasi appeler le Dieu des maçons ou architectes, et d'autant qu'il possedoit vint mil (livres) en bénéfices et qu'il se sçavoit bien accommoder à la Cour.*" The first volume of de l'Orme's "*Architecture*" is full of laments about the calumnies of which he was victim, and the cabals that were formed against him. He justifies his possession of ecclesiastical revenues as being payment for his work and what he had laid out upon it. But if he were scandalized, he knew how to revenge himself. Upon almost every page of his "*Architecture*" are the most bitter allusions to his contemporaries, who "as draughtsman of plans, mostly knew not how to draw them," "*si ce n'est par l'ayde et moyen des peinctres, qui les sçavent plus tost bien farder, laver, ombrager et colorer, que bien faire et ordonner avecques toutes leurs mesures.*" And, carried away by his anger and his convictions, he devoted the last chapter of his book to a psychological study of a true and a false architect, with caricatures drawn by his own hand. M. Vachon reproduces the plate of the good architect, which resembles some of the allegorial cuts of Albert Dürer in style.

On the death of Henri II, de l'Orme fell into disgrace. Robbed of the patronage of Diane de Poitiers, he lost his Inspectorship of Royal Buildings, and had the mortification of seeing Primaticcio put into his place; but the ecclesiastical benefices he seems to have kept until his death in 1570, which took place in his house in the cloisters of Nôtre Dame, Paris, of which he was a canon.

The project of erecting a palace, "des Tuileries," was conceived by François I, but the idea was not carried out until after his death. Catherine de'Medici entrusted the work to Philibert de l'Orme, but she seems herself to have made certain suggestions to the architect. Desiring as she did. to have a building which would be the direct opposite to the sombre fortresses of the Louvre and the Tournelles, her idea was to surround it with gardens, and to make it picturesque. De l'Orme chose the Ionic Order, because he says "*il est féminin et a esté inventé après les proportions et ornements des Dames et Déesses, ainsi que le Dorique des hommes, comme m'ont appris les anciens; car quand ils vouloient faire un temple à quelque Dieu, ils y emploient l'ordre Dorique et à une deesse le Ionique.*" Where de l'Orme learned this we cannot tell, as a very limited study of the work of the "ancients" proves the fallacy. To go no farther than Athens, the Parthenon (the temple of Athena) is Doric; but doubtless study of the antique in Philibert's time was confined to Rome and a few other Italian towns. However that may be, he considers the Ionic "*délicat et de plus grande beauté que le Dorique et plus orné et enrichy de singularitez.*" Certainly these qualities may have fitted it to be the style of a palace built for Catherine de'Medici, especially its singularity. But the Queen's Florentine tastes desired that the palace should be a mass of marbles and incrustations, and no doubt had it been finished by de l'Orme it would have equalled some of the Italian palaces of the period, for the plan of it left by du Cerceau, shows the grandiose scale upon which it was to be built. The original design for the central pavillon was a sexagonal attic supporting a dome. This was never carried out, de l'Orme's building only being partially finished at his death, when it was committed to Bullant, Lemercier, Levau and d'Orbay in succession, who all of them modified the original designs; the last architect replacing the beautiful staircase with a commonplace one with a balustrade decorated with the emblems of Louis XIV.

But de l'Orme's greatest work was the Château d'Anet, built for Diane de Poitiers. Possessing an immense fortune and being a woman of taste, she desired the building to be original, grand and noble. Moreover, being the rival of the queen, she wished to out-do the latter's new palace in magnificence and to erect a building which should be purely French. This being so, what more natural than that she should endeavor to carry off the queen's architect.

The plan of the château shows a central building surrounded by gardens, terraces, and out-buildings, including a chapel and *hôtel*

[1] *Les Artistes Célèbres, Philibert de l'Orme*, par Marius Vachon: Rouam, Paris.

dieu, the whole enclosed by a moat and external walls. The entrance was a triumphal arch, in the tympanum of which was the celebrated bronze group of Diana and the Stags, by Benvenuto Cellini, which was executed by order of François I for Fontainebleau, and afterwards taken to the château d'Anet by Henri II at the instigation of Diane de Poitiers. This alto-relief, now in the Renaissance Museum of the Louvre, and called the "Nymph of Fontainebleau," was placed in 1806 above the gallery by Jean Goujon, at the entrance of the Salle des Caryatides of the Museum. In 1846 it was taken down and replaced by a cast, which still remains. At the angles of the arch, on each side of the "Diane," were two Fates in bronze, also by Cellini, while at the sides of the niches were bronze heads of winged cupids. The following inscription was placed upon a black marble tablet above the door:

Phœbo sacrata est almæ domus ampla Dianæ
Verum accepta cui cuncta Diana refert.

On the façade of the château we read another inscription, which shows a curious trait in the morals of the sixteenth century:

Brœzeo hæc statuit pergrata Diana marito
Ut diuturna sui sint monumenta viri.

For what was Diane "*reconnaissante à son mari de Brézé*"? This façade was destroyed in 1799–1810, but a portion of it was saved by Alexandre Lenoir and placed in the Musée des Petits-Augustins, may now be seen in the court-yard of the École des Beaux-Arts, which occupies the same site. De l'Orme, with his usual vanity, speaks of his work thus: "*J'ay fait faire au château d'Annet entre plusieurs belles œuvres* ——," and then he enumerates his several works. The chapel, which is domical, and a remarkably beautiful example of French Renaissance, with one wing of the château, is all that remains of the splendid building. The chapel was restored by Caristie in 1844.

Another of de l'Orme's famous buildings was the Château de Saint-Maur-les-Fossés, belonging to the Cardinal du Bellay, bishop of Paris. This, too, has disappeared — it was destroyed before the Revolution. Engravings from the artist's book on "*Architecture*" of this, the château d'Anet and the Tuileries, with plans, are all reproduced in M. Vachon's book.

But there is one of de l'Orme's works which can be studied in all its original beauty, viz., the monument of François I at St. Denis, one of the most beautiful tombs of the Renaissance. The monument is of the form of a triumphal arch, with Ionic columns supporting a platform, upon which are kneeling figures of the king, Claude, his wife, and three children. Underneath the arch is a sarcophagus, upon which repose the figures of François and Claude, while all around the lower part are bas-reliefs by Pierre Bontemps, representing the various campaigns carried on by the king. De l'Orme was assisted in this work by other sculptors besides Bontemps—Germain Pilon, Ponce Jacquiand, Françoys Marchand, Ambroise Perret, Jacques Chauterel, Bastien Galles, Pierre Bigoine and Jean de Bourges. De l'Orme also carried out work at St. Germain-en-Laye, at Fontainebleau, at Vincennes, at Chenonceau and at Madrid, in the Bois de Boulogne.

M. Vachon excuses de l'Orme's egotism and vanity because of his hatred of the foreigner. At that period, the connection of the sovereigns with Italy through their wives, and the wars which were carried on in that country, naturally forced the beauty of Italian buildings upon the notice of men of taste like François I. Consequently, he invited a whole corvey of Italian artists to France. Of these, de l'Orme and his friends were jealous, but unjustly, for he had himself studied in Italy and owed his success to that study. That he was a man of genius there is no doubt, but his talent consisted in acquiring knowledge from the Italians, which he applied to his own wants. That he created a French Renaissance is true, but that it was modelled upon the Italian is equally true. M. Vachon is a patriot and de l'Orme's chief merit in his eyes is that he was "*bien Français*" but art is not a matter of patriotism, it is cosmopolitan, and far more was it to the credit of de l'Orme that he had true ideas upon the right uses of art than that his art was "*bien Français.*" He desired that buildings should be suitable to the purposes to which they were to be put. "*Mieux vaudrait,*" he says, in his first volume of "*Architecture,*" "*ne savoir faire ornements ni enrichessements de murailles ou autres, et entendre bien ce qu'il faut pour la santé et conservation des personnes et des biens.*" This is a golden rule which might to advantage be observed in these modern times.

S. BEALE.

SOCIETIES

NEW YORK CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS.

EXTRACT from minutes of the New York Chapter of the American Institute of Architects:

"*Whereas*, the Commissioners of the Sinking Fund of the City of New York have, under authority given to them by an act of the Legislature entitled 'An Act to provide for the erection of a building for Criminal Courts and other purposes,' issued on invitation to architects to prepare plans, in competition, in accordance with certain printed instructions and general plans."

The New York Chapter of the American Institute of Architects, having at heart the proper architectural embellishment and future architectural standing of this metropolis, believe it to be their duty, which they owe to the municipal officers, to the citizens, to the profession of architecture, and to themselves, to earnestly advise against the adoption or execution of any plans based upon the instructions and general plans issued, and would recommend to the Commissioners, if it is still their determination to place the proposed structures on the City Hall Park, in contiguity to the City Hall, that sufficient extension of time be granted, and the following conditions be observed:

1st. That the manner of grouping the buildings and the planning and distribution of the rooms be left to the competitors, limited only by the specified requirements of space for the various departments, etc., to be accommodated.

2d. That disinterested professional experts, who should be architects of acknowledged ability, experience, and standing, should be appointed, to whom all the plans would be referred for analysis and classification, and who would make a detailed report to the Commission for their consideration, with recommendations as to the award of premiums and choice of plans.

3d. That the successful competitor should be appointed architect of the building; provided that in case he should not be, in the judgment of the said experts and Commission, a person of sufficient artistic or constructive or administrative capacity, then there shall be appointed an associate or consulting architect, so qualified, whose compensation shall be deducted in equitable proportion from that of the architect.

A. J. BLOOR, *Secretary.*

A true copy.

COMMUNICATIONS

WHO SHOULD PAY THE EXPERT?

ALBANY, N. Y., February 4, 1888.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Will you kindly favor us with your opinion in regard to case stated below; we dislike to take up your valuable time, but it is a matter of adjustment depending on what is customary or right.

We are architects for a large hall to seat 2,500, and the heating and ventilation is of the greatest importance. The Committee and ourselves are both desirous of having the heating and ventilating plans prepared by an expert, and the question arises, who shall pay for such expert work. We claim that after the heating plans are prepared that we will have to lay out all flues, etc., on builder's plans, and, in addition, must get all estimates and give special superintendence to this part of the work, as expert is non-resident and is not employed to do that portion, and that we should not pay expert from our commission, but that he should be paid in addition to per cent we receive on the entire work including heating and ventilation.

Respectfully yours, ENQUIRERS.

[In regard to the question, Who should pay for expert advice about heating and ventilation, we think that most experienced architects would agree that the heating and ventilation of a building was a matter strictly within the architect's province. If, as often happens, the architect wished to have his plans for it criticised by an expert, and to obtain suggestions in regard to details, he would do so in such manner as he might wish, paying the expert out of his own pocket, and, of course, in such a case, the expert, being only called in for comments upon the work of the architect, his fee would be a small one. If, instead of this, the committee desires to deprive the architect entirely of a responsibility which, with such advice as he can procure for himself, he is willing to take, and to trust the whole matter to an outsider, leaving to the architect the care of carrying out the expert's ideas, we think that the committee should bear the whole expense. Although the architect is nominally relieved of a part of the responsibility which he is paid for taking, he really gains little or nothing in this respect, for if he is obliged to look out for the execution of the plan, he is sure to have all imperfections in the working of the scheme charged to his account, while the extra labor thrown on him by the necessity of changing his plans for the arrangement or decoration of the building to suit the wishes of an outsider who cares for nothing except his own scheme, will be very considerable. — EDS. AMERICAN ARCHITECT.]

THE COMMISSION ON A PARTY-WALL.

CHICAGO, ILL., February 13, 1888.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—What would be a reasonable and proper charge to make a client for computing the value of party-wall, making and submitting a statement of same? I do not find any official statement of fees, and am somewhat uncertain as to what custom has sanctioned. Owing to some delay in using the wall, after the statement had been submitted the actual settlement was made between the two owners themselves, instead of through their architects. My client accepted the offer of $3,000 for the wall. My statement made the value of the half sold $3,109.87, which included $119.61 as architect's commission. This last item was objected to by the architect of the purchaser, he claiming that he was entitled to architect's commission on the wall purchased by his client. Of course, it made no difference to me as I had already been paid my commission, but I would like your views upon the question as to which was right, if either, in the light of established precedent. Also what, under the circumstances as detailed, a proper charge would be for my services

in computing the value of the wall, drawing up statement and spending some little time — perhaps one-half day — in visiting the owner and the other architect before the matter was finally adjusted.

Very respectfully, O. J. Pierce.

[We should say that the best way would be to charge according to the time occupied in the work of making estimates and preparing the statement, reckoning the value of the time according to the architect's engagements.

It is customary in this vicinity to count the commission of the architect under whose direction the wall was built as a part of the value of the wall, to be shared between the parties, just as Mr. Pierce estimates it; but this does not at all affect the right of the architect of the adjoining building to charge his commission also on it, under the general rule that the architect's commission is always reckoned on the total cost of the structure ready for occupancy, including materials furnished by the owner. Both architects are therefore right in their view of the case. — Eds. American Architect.]

THE ARCHITECTURAL LEAGUE COMPETITION.

Los Angeles, February 4, 1888.

To the Editors of the American Architect: —

Dear Sirs, — Having seen the prize designs in the late Architectural League Competition, I can say nothing against either of them regarding their fitness as ornaments to a village green, but I feel disposed to take exception to the manner in which the programme was worded.

It is apparent that if only three of forty-four competitors properly interpret the problem, that the committee should have used a phrase to more clearly define the same than the word "tower," which means a high edifice. The forty-one competitors who were, unfortunately, in ignorance of the fact that the word "tower" meant a *low* edifice is such a large majority of all as to raise at once the query, Why so many dullards? — a fact which (being one of the dullards) I attribute to the wording of the circular of the competition.

Very truly yours, Willis J. Polk.

ADDRESS.

New York, February 13, 1888.

To the Editors of the American Architect: —

Dear Sirs, — The address of the Secretary of the *Journal* of Associated Engineering Societies, called for in a recent number, is Henry G. Prout, 71 Broadway, New York. Yours very truly,

C. Powell Karr.

NOTES AND CLIPPINGS

Combustibility of Iron. — Some curious experiments to demonstrate the combustibility of iron were made by the late Professor Magnus, of Berlin, Ger. In one a mass of iron filings is approached by a magnet of considerable power, and a quantity thereof is permitted to adhere to it. This loose, spongy tuft of iron powder contains a large quantity of air imprisoned between its particles, and is, therefore, and because of its extremely comminuted condition, well adapted to manifest its combustibility. The flame of an ordinary spirit lamp or Bunsen burner readily sets fire to the finely-divided iron, which continues to burn brilliantly and freely. By waving the magnet to and fro, the showers of sparks sent off produce a striking and brilliant effect. The assertion that iron is more combustible than gunpowder has its origin in the following experiment, which is also a very striking one: A little alcohol is poured into a saucer and ignited. A mixture of gunpowder and iron filings is allowed to fall in small quantities at a time into the flames of the burning alcohol, when it will be observed that the iron will take fire in its passage through the flame, while the gunpowder will fall through it and collect beneath the liquid alcohol below, unconsumed. This, however, is a scientific trick, and the ignition of the iron is due to the fact that the metal particles, being admirable conductors of heat, are able to absorb sufficient heat during their passage through the flame — brief as this is — and they are consequently raised to the ignition point. The particles of the gunpowder, however, are very poor conductors of heat, comparatively speaking, and during the exceedingly brief time consumed in their passage through the flame, they do not become heated appreciably, or certainly not to their point of ignition. — *Springfield Republican.*

Natural Gas in England. — Mr. Richard S. Bluck writes to the *Peterborough Advertiser:* "Many of your readers are aware that on the Fletton and Woodstone side of Peterborough there are a number of brick-works, but perhaps they may not know the lower the clay for making bricks is obtained, the less coal it takes to burn the bricks. After getting some few feet down, the clay contains natural fuel, and the deeper the clay is dug, the more natural fuel it contains. When the bricks made from the lower clay (which is really a shale) are being burnt, they throw out a gas which can be clearly seen burning in the kiln between the bricks, and I wish to point out the great probability of there being at no great distance below the shales now worked stores of natural gas similar to that now used in Pittsburgh, Pa., and lately discovered in north-western Ohio, and which, if found, would make Peterborough into one of the most important manufacturing centres in the world. Builders in Peterborough are aware that bricks can now be bought cheaper at the Fletton and Woodstone yards than anywhere in England, the reason being the coal-bill is so much reduced since the lower shales have been made into bricks. I would most respectfully ask the Peterborough Town Council to consider the desirability of boring down to see if the gas is below the town of Peterborough. As a matter of course, it is needless for me to point out to so able a Board of business men how natural gas, if found, would find employment for every man in the district who was willing to work, how it would increase the value of all property in the neighborhood, and cause manufactories and new industries to spring up on every side."

TRADE SURVEYS

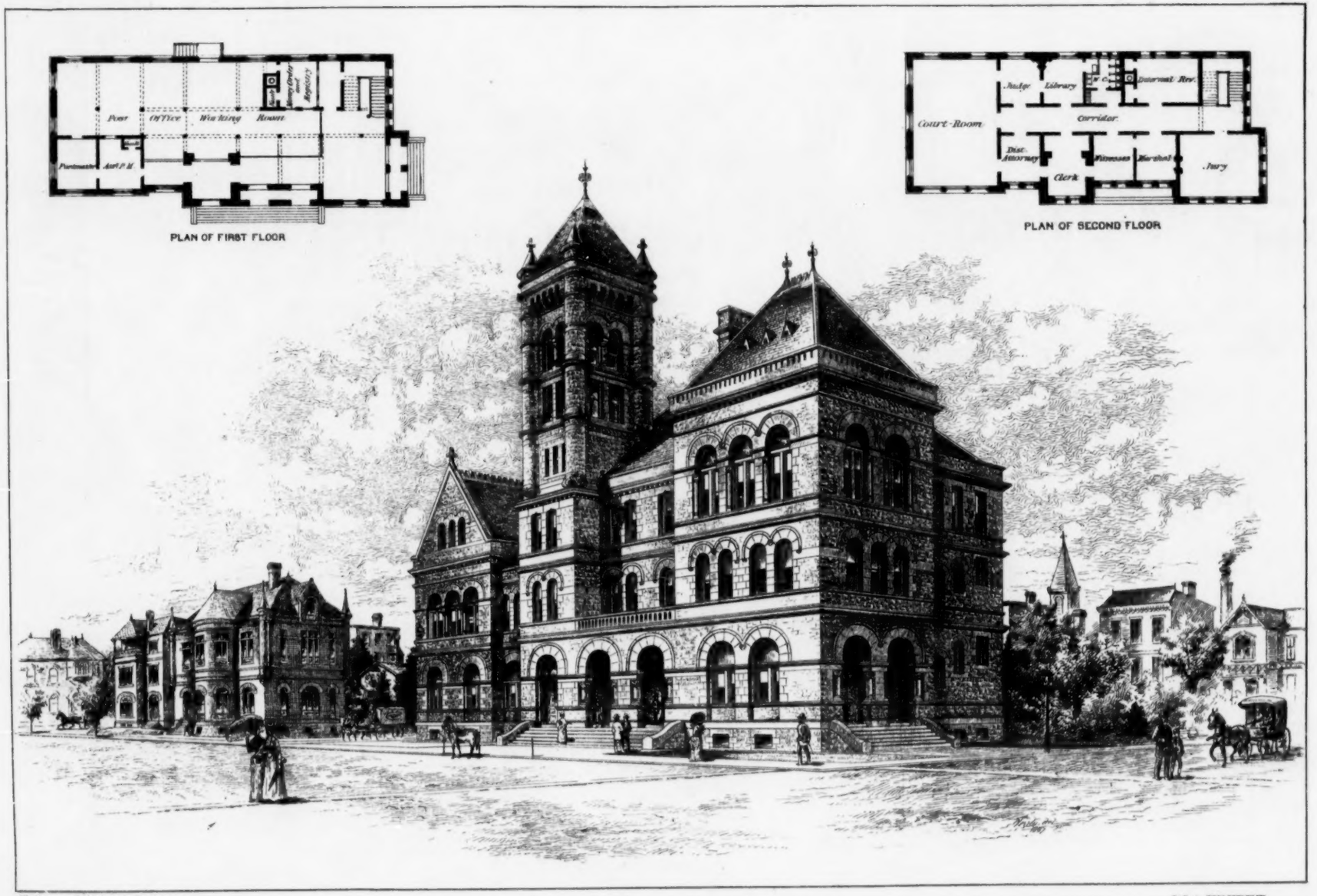
"Traffic is up to the average" summarizes the reports in some fifteen or twenty trade journals of the past week. Not a few journals speak of the upward tendency in values and prices, and those editors who are inclined to take a hopeful view of things, say, the outlook is decidedly better than it was twelve months ago. So far as the opinion of editors of trade journals and writers of financial articles go, there is very little to fear and very few regrets to be expressed with the volume of business which has been transacted since January 1. Reports from all quarters are favorable for a steadiness of productive capacity throughout the winter. Reading between the lines and going below the surface, facts and conditions are met with which must modify the hopefulness that is so freely expressed in so many quarters. Yet, the trade representatives are doing good service, and financial writers are accomplishing some good in checking a decline in confidence where there may be really no good reasons for it. At the same time there are some influences at work which will have their way regardless of what people may say about them. One of these influences concerning which but little is said, and, perhaps, less noticed, is the disposition of a great many large consumers and operators to purchase material only for immediate requirements. If this policy could be kept up year in and year out, it would be much better for all concerned. The opinion is entertained by some that business is never good unless people are buying what they do not want, and what they do not expect to use for from one to six months ahead. We are having less prosperity of this kind than usual, and perhaps more of the prosperity which is based upon the purchase or immediate and actual requirements. To the extent that this policy affects prices, prices are declining. There is nothing of a speculative character to be met with or to be found in stock-broking circles. Even in our stock-boards complaint is made of the absolute dulness and the absence of outside buyers. The outside buyers for once are showing good sense in allowing speculators and boomers of stocks to have their own way. This is due largely to the experience of the past two years in manufacturing and legitimate commercial directions of the great body of private speculators who are awaiting developments. The general public who have experience and labor to sell and trade requirements to fill, have but little interest in the ups and downs of stocks, but are chiefly interested in the actual condition of things apart from their speculative values. A little study of these conditions will throw a great deal of light upon the present and future trade prospects. Since the opening of the year $70,000,000 worth of bonds have been sold, and it is believed that most of them have been taken by foreign and small investors. A host of engineering and other enterprises are before the public wherein money can be invested, whether safely or not, it is not an easy matter to say. Opportunities for railway investment are growing smaller, because of the fact that established railroad companies are doing the bulk of the new railroad building. This is true largely of mining operations. Large companies are extending their operations without outside help. Individual investors will, in time, be compelled to organize special agencies to secure safe investments. There are combinations among investors in new schemes and enterprises, as well as combinations in trusts and syndicates. The outflow of money on Western bonds and mortgages still continues. The opportunities for profitable investment are increased rather than otherwise on account of the great expansion in manufacturing throughout the West. Money is wanted there, and will, no doubt, seek the opportunities that are being offered. The fact that $200,000,000 will be divided among holders of railway bonds and securities this year will help to strengthen the confidence in the earning capacity of our railway systems. The fact that there is a vast amount of uncovered territory in the West and South will, in all probability, lead to the projection and the construction of a number of new roads there. The importance of this fact cannot easily be overestimated. Just now the opinion is entertained that railway construction will fall far below the limit of last year. But the necessity of covering railroad territory against competitors is not fully taken into account. Last week two or three permanent railway enterprises were brought to the attention of a few large financial organizations in New York, in which railway managers are interested. Whatever assistance is wanted by the railroads themselves will be obtained from these quarters. Another important fact of recent development is the early emigration of a large number of manufacturers, mechanics, traders and others into the region west of the Mississippi river. The competition East and the better opportunities West, coupled with the abundance of money which can be borrowed and aided by the prospects of continuance of business prosperity, has laid the foundations for something like an exodus of a most desirable class of people. Iron and steel makers, carriage and wagon builders, hardware manufacturers, house-builders, material manufacturers, lumber-dealers, coal-miners, among other equally valuable factors in industrial development will seek new homes and opportunities in the new region made available by the 20,000 miles of railway-construction in the far West during the past three or four years. This movement simply means that there is a new force at work to equalize energy, labor and capital, and that the West will receive the first benefit of it, and the East the resulting benefit of the equalization.

Without theorizing or dealing in generalities, it may be said that this movement is a wide and a far-reaching one, and it may be said that there are such abundant opportunities for a spreading out of the population that no very serious results need be apprehended to the industries at large. Labor, in general, is well engaged. The anthracite strike is practically over, the Northwestern Railway war will be ended, perhaps, in two weeks. Other railway systems have taken warning and are putting their defences in order. The industries of New England anticipate an early revival of trade, and all its mills and factories will be pretty well employed. The multiplication of combinations still continues, but the Government, State and National, is on their path with a view of keeping them from trampling upon the public. How much Legislation can prevent or retard this tendency it is not easy to say, but vast combinations are the legitimate and necessary result of the conditions under which we live, and it is probably safe to say that nothing more than a police surveillance can be kept upon them.

S. J. Parkhill & Co., Printers, Boston.

No. 635. American Architect and Building News, Feb. 25, 1888.

COPYRIGHT 1888 BY TICKNOR & CO



Heliotype Printing Co. Boston.

U. S. Court House, Post Office &c.
WILLIAMSPORT, PA.

W. A. FRERET
Supervising Architect.

AMERICAN ARCHITECT AND BUILDING NEWS, FEB. 25 1888 No. 635

COPYRIGHT 1888 BY TUCKER & CO

Y·M·C·A·BUILDING:
SAN·DEIGO·CAL:
ERNEST·A·COXHEAD:
ARCHITECT·A·R·I·B·A·
LOS·ANGELES:

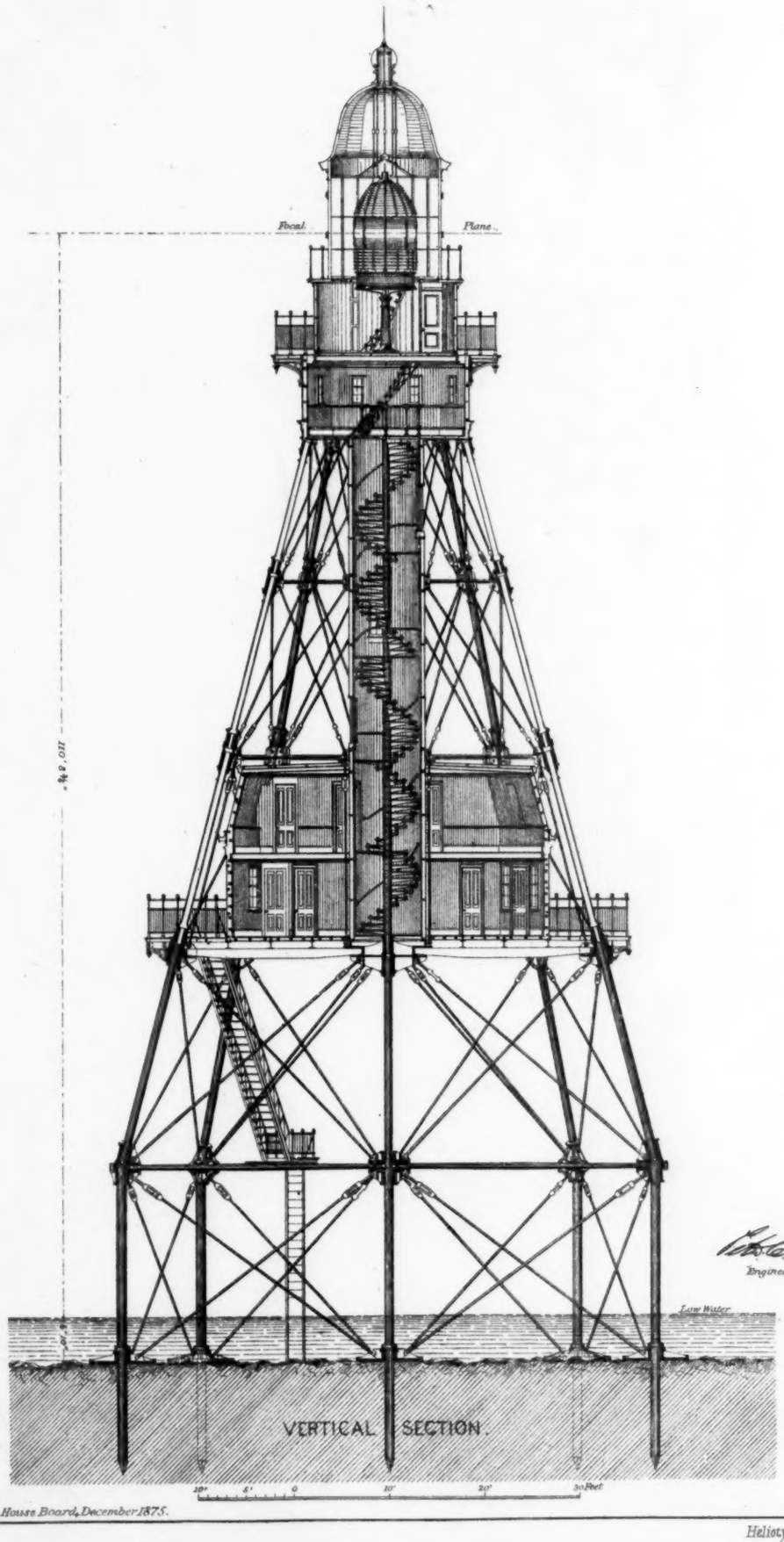
Heliotype Printing Co. Boston.

COPYRIGHT 1888 BY TICKNOR & CO

Store Building for S. E. Mayall. Esq
St Paul. Minn
J. Walter Stowey. Archt St Paul. Minn

Heliotype Printing Co. Boston.

COPYRIGHT 1888 BY TICKNOR & CO.



Heliotype Printing Co. Boston.

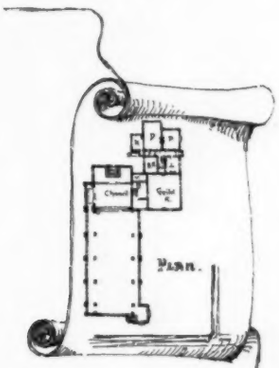
FIRST ORDER L. H. ON FOWEY ROCKS, FLA.

COPYRIGHT 1888 BY TICKNOR & CO

Store Building for Messrs. Peters & Carr
St. Paul - Minn
J. Walters Stevens - Archt St. Paul

Heliotype Printing Co. Boston.

COPYRIGHT 1888 BY TICKNOR & CO.



CHRIST CHURCH, HERKIMER, N.Y.

R. W. GIBSON
ARCHITECT
ALBANY N.Y.

Heliotype Printing Co. Boston.